Contents

UNIT 1: TYPES OF COMPUTERS

Task 1. Give definitions to the following terms and translate them into Russian:

desktop PC	stylus
laptop	supercomputer
mainframe	tablet PC
physical keyboard	touchpad
screen	virtual keyboard

Task 2. Read the text below and use the words given on the right to form a word that fits in the gaps:

Are mainframes the same thing as supercomputers? Not at all. Both of them push the limits of what can be accomplished through computing. These two are large and (1) _____ machines, however, they refer to (2) _____ different kinds of hardware and types of computing. The (3) _____ distinction between mainframes and supercomputers is the type of problems they tackle.	*power* *fundamental* *big*
Supercomputers conduct large amounts of very fast and complex (4) _____ on data stored in memory. These computers (5) _____ to run complex simulations.	*calculate* *build*
Mainframes process the large amounts of data that come into them from external sources, such as credit card transactions or payroll processing.	
So, the (6) _____ of the supercomputer is higher compared to the mainframe as supercomputers can execute billions of (7) _____ per second, processing one single but most complex problem at once. Mainframes, in turn, process thousands of queries simultaneously. As a result, their performance is (8) _____.	*perform* *operate* *slow*
They will both continue to dominate the heavy duty computing needs of (9) _____, science, government, and many other fields. Their power and specialized (10) _____ make them well-suited for their particular tasks.	*busy* *capable*

Task 3. Read the text about the tablet computer and complete the blanks with the following words:

virtual / lack / access / sharing / rechargeable / Bluetooth / resemble / gestures / navigate

A tablet computer, commonly shortened to a tablet, is a mobile device, typically with a mobile operating system and a (1) _____ battery in a single, thin and flat package. Tablets, being computers, do what other personal computers do, but (2) _____ some input/output abilities that others have. Modern tablets largely (3) _____ modern smart phones, the only differences being that tablets are relatively larger than smart phones, with screens 7 inches or larger, measured diagonally, and may not support (4) _____ to a cellular network.

The touch screen display is operated by (5) _____ executed by finger or digital pen (stylus), instead of the mouse, trackpad and keyboard of larger computers. Tablets do not usually have physical keyboards and accept text and other input by use of a (6) _____ keyboard shown on their touch screen displays. To compensate for their lack of a physical keyboard, most tablets can connect to independent physical keyboards by (7) _____ or USB.

A key component among tablet computers is touch input on a touch screen display. This allows the user to (8) _____ easily and type with a virtual keyboard on the screen or press other icons on the screen to open apps or files.

Popular uses for a tablet PC include viewing presentations, video-conferencing, reading e-books, watching movies, (9) _____ photos and more.

Task 4. Watch a video on different types of computers at https://www.youtube.com/watch?v=ItxwyMR0SnY and complete the blanks:

Desktops

1. ……..the reason is desktop computers are not _____, so you can't just _____ and go anywhere with your desktop computer.
2. ... so you _____ portability, but what you gain on the hardware side is a big plus.
3. The computer case _____ you for a lot more customization options when it comes to the computer's _____.

4. Another great thing about desktop computers is they have a _____ keyboard …
5. Those are some of the _____ of a desktop computer.

Laptops

6. _____, we have laptop computers. They are _____ in two different ways.
7. ….and it won't _____ your other power option which is your battery.

Tablets

8. Tablets have some great benefits as well. The main one - they are _____.
9. The main _____ of tablets is that they typically use a mobile operating system.
10. What you _____ in portability you lose in functionality …

Servers

11. You are _____ that server's information to watch these videos.
12. On the business level, they are used to _____ files.
13. This is a lot faster than running a _____ around the office and giving people files that way and emailing _____.

Task 5. Translate the following sentences from Russian into English:

1. Это переносное устройство, но оснащено тем же объёмом памяти.
2. Считается, что планшеты менее мощные, чем ноутбуки.
3. Сенсорный экран позволяет вводить текст без традиционной клавиатуры.
4. Мэйнфреймы могут обрабатывать и хранить большие объёмы данных.
5. В результате их производительность гораздо ниже.
6. Мэйнфреймы способны выполнять больше параллельных операций, чем ПК.
7. Эта характеристика может быть как преимуществом, так и недостатком.
8. Ноутбуки оснащены сенсорной панелью, встроенной в клавиатуру.
9. Эта модель имеет доступ к Интернету.
10. Основное различие между ними – это задачи, которые они решают.

Task 6. Think of one of your recent purchases (phone, camera, laptop). Compare it to the previous model you had by size, features, convenience, etc.

Task 7. Complete the blanks with the correct prepositions:

than / from / as / for / by / between / in / with / about / of

1. Most tablets can connect to independent physical keyboards ____ Bluetooth or USB.
2. The biggest distinction ____ mainframes and supercomputers is the type of problems they tackle.
3. Another great thing ____ desktop computers is that they have a detached keyboard.
4. A tablet computer is a mobile device ____ a mobile operating system.
5. Instead ____ a mouse, laptops have a touchpad built into the keyboard.
6. Tablets have some great benefits ____ well.
7. Mainframes process a large amount of data that comes ____ external sources.
8. They have a lot of connectivity options ____ connecting peripherals.
9. Modern tablets are relatively larger ____ smart phones.
10. Laptops are powered ____ two different ways.

UNIT 2: INPUT & OUTPUT DEVICES

Task 1. Give definitions to the following terms and translate them into Russian:

barcode reader
headphones
keyboard
microphone
monitor
mouse
printer
scanner
speakers
touch screen
trackball
web camera

Task 2. Read the text below and mark the following statements as true or false:

1. Most flat panel monitors use CRTs to display images.
2. Active matrices allow monitors to display HD images.
3. Multiple bitmaps come together to create a single image.

Monitors

A monitor is a computer component that shows images. Displays appear on monitor screens.

Most of today's monitors have flat-panel displays. They usually produce images using LCDs. Older monitors used CRTs, which made them bulky. As monitors became thinner, image resolution also improved. Current HD displays have far better resolution than standard ones. Active matrices give monitors this capability.

Displays are made up of many tiny pixels. A bitmap organizes many pixels into a single image. To display images, computers switch between bitmaps. Frame buffers store bitmaps before displaying them on the monitor.

Task 3. Fill in the blanks with the following words:

CRT / screen / flat-panel / component / HD / pixel

1. People can control tablet PCs by touching the _____.
2. The customer was impressed by the thinness of the monitor _____.
3. On very old displays, you could see each individual _____.
4. Old monitors were bulkier than new ones because they each used a(n) _____.
5. For the best resolution, get a(n) _____ display.
6. Each _____ of the computer performs a different function.

Task 4. Read the sentence pairs and choose which word or phrase best fits each blank:

1 **bitmap / LCD**

A: The computer's _____ is capable of showing detailed, vibrant images.

B: A(n) _____ tells pixels on a screen how to form into an image.

2 **active matrix / frame buffer**
A: The display's _____ allows it to control each individual pixel.
B: The _____ stores bitmaps before the monitor displays them.

3 **display / monitor**
A: Jim's _____ is so old that it still uses a CRT.
B: Consumers really like the sharp _____ on the new screens.

Task 5. Read the text below and use the words given on the right to form a word that fits in the gaps:

Types of scanners

Flatbed Scanner
A flatbed scanner has a flat surface on which you lay documents to be scanned. The sensor and source of light move across the glass pane to scan the document and (1) _____ its digital copy. If you want to scan transparent slides on your flatbed scanner, you will (2) _____ a transparency adapter. Flatbed scanners derive their name from the fact that their glass plane or bed, where the object to be scanned is placed, is flat.

product

requirement

Sheetfeed Scanner
As its name (3) _____, in this type of scanner the document is fed into the (4) _____ or vertical slot provided for it. The main components of a sheetfeed scanner include the sheet-feeder and scanning module. While the sensor and source of light (5) _____ across the glass pane in flatbed scanners, in sheetfeed scanners, they are stationary. Instead, the document moves through the scanner. Ideal for scanning single page documents, these scanners cannot scan (6) _____ objects, like books, and that, perhaps, is their major drawback.

suggestion

horizon

movement

thickness

Handheld Scanner
A handheld scanner is a small manual scanning device which is moved over the object that needs to be scanned. In flatbed and sheetfeed scanners, you put the document that is to be scanned inside the device. In contrast, in the case of handheld scanner,

you have to drag it over the document that is to be scanned.
Using a handheld scanner can be a cumbersome task as the hand needs to be steady all the time. Even a slight movement of hand can lead to (7) _____ of the image. One of the most-utilized handheld scanner is the barcode scanner, (8) _____ used in stores.

distort

type

Film Scanner

A film scanner (9) _____ to scan photographic films directly into a computer. The photographer has direct control over certain aspects, such as cropping, ratio of original image on the film, etc. Some film scanners available today have specialized software through which it is possible (10) _____ scratches and improve color quality.

utility

minimum

Task 6. Complete the blanks with the correct prepositions:

to / into / by / with / between / at / of / around / per / on

1. A mouse allows you to drag the cursor and move ____ the screen very quickly.
2. The space bar is a long key ____ the bottom of the keyboard.
3. A mouse has one or more buttons to communicate ____ the computer.
4. An LCD is made of two glass plates with a liquid crystal material ____ them.
5. Arrow keys are used to move the cursor, as an alternative ____ the mouse.
6. The quality of the images goes up to 2,400 dots ____ inch.
7. Input devices are the pieces of hardware which allow us to enter information ____ the computer.
8. The resolution of a printer depends ____ the number of pins.
9. Speech recognition software lets you operate computers ____ voice command.
10. Resolution refers to the number ____ dots of color, known as pixels.

Task 7. Translate the following sentences from Russian into English:

1. Клавиша ‘обратный ход’ удаляет символ слева от текущей позиции.
2. Вспомогательная клавиатура расположена справа от основной клавиатуры.
3. Лазерный принтер использует лазерный луч, чтобы закрепить чернила на бумаге.

4. Разрешение сканера измеряется количеством точек на дюйм.
5. Струйный принтер производит изображения путём распыления мельчайших капель чернил на бумагу.
6. Частота, с которой монитор обновляет изображение, измеряется в Гц.
7. Ручные сканеры идеальны для считывания небольших изображений.
8. Беспроводная мышь отправляет данные посредством инфракрасного излучения или радиоволн.
9. Клавиша ‘caps lock’ переводит клавиатуру в режим заглавных букв.
10. Этот прибор считывает штрих-код товаров, продаваемых в магазинах, и передает информацию о цене в компьютер кассового аппарата.

UNIT 3: THE CPU

Task 1. Give definitions to the following terms and translate them into Russian:

single-core processor	processor-intensive tasks
multi-core processor	CPU cache
clock speed	arithmetic logic unit
parallel processing	control unit
Simultaneous Multithreading	registers

Task 2. Read the text about single-core and multi-core CPUs and mark the following statements as True or False:

1. The performance of the CPU can only be increased by modifying its clock speed.
2. Multi-core processors can cope with multitasking better because tasks are handled in parallel.
3. One of the disadvantages of multi-core processors is that they consume more power.
4. With a quad-core processor, each instruction is executed four times faster.

Single-core and multi-core CPUs

The CPU is a very complicated chip consisting of billions of electronic components. It is fitted on the motherboard with other electronic components. Operational advancements of microprocessors over the years were primarily due to speed (frequency) and parallelism increment. Since it is not always possible to further increase the performance of the CPU by modifying its clock frequency, vendors have shifted their attention to designing multi-core processors. A multi-core processor consists of two or more cores on a single die. The individual cores on a multi-core processor don't necessarily run as fast as the highest performing single-core processor, but they improve overall performance by handling more workload in parallel. Some other benefits of multi-core architecture include lower power consumption, and better cooling as multi-core processors usually run at a lower clock speed to dissipate less heat.

The performance of single-core and multi-core processors is better understood by observing how the two execute programs. Single-core processors running multiple programs would assign different time slices for these programs; if one of the processes is taking longer time to complete, then all the rest of the processes start lagging behind. However, multi-core processors handle multitasking much better, since each task will be executed by a separate core in parallel thus boosting the performance. The capability of multi-core processors to run multiple applications more efficiently made it possible for computer users to keep working at the same time running the most processor-intensive tasks in the background. However, while a quad-core CPU, for example, handles multitasking better, it doesn't mean that a single operation will be executed four times faster. To increase the speed significantly, a program must have a special SMT (Simultaneous Multithreading) code written into it.

Task 3. Find English equivalents for the following words and expressions in the text:

1. увеличить производительность
2. отставать, запаздывать
3. расход энергии
4. кристалл интегральной микросхемы
5. справляться с многозадачностью

Task 4. Read the text below and fill in the gaps with the suitable words:

significant / impact / handle / splits / cycles / outperform / measured

What is clock speed?

The performance of the CPU has a major (1) ____ on the speed at which programs are loaded and how smoothly they run. There are a few different ways to measure processor performance, but clock speed ("clock rate" or "frequency") is one of the most (2) _____. The CPU processes many instructions from different programs every second and the clock speed determines the number of (3) _____ the CPU executes per second. Clock speed of modern CPUs is (4) ____ in GHz (gigahertz). For example, a CPU with a clock speed of 3.2 GHz executes 3.2 billion cycles per second.

In general, a higher clock speed means a faster CPU, but other factors should be taken into consideration as well. Since different CPU designs (5) ____ instructions differently, it's best to compare clock speeds within the same CPU brand and generation.

For example, a CPU with a higher clock speed from five years ago might be outperformed by a new CPU with a lower clock speed, as the newer architecture deals with instructions more efficiently. An X-series Intel® processor might (6) _____ a K-series processor with a higher clock speed, because it (7) _____ tasks between more cores and features a larger CPU cache. But within the same generation of CPUs, a processor with a higher clock speed will generally outperform a processor with a lower clock speed.

Task 5. Watch a video about CPU cache at https://www.youtube.com/watch?v=yi0FhRqDJfo ***and mark the following statements as <u>True</u> or <u>False</u>:***

1. Static RAM is constantly refreshed by electricity to store data.
2. SRAM is faster than DRAM.
3. The computer cannot run without the CPU cache.
4. Level 1 cache is the fastest cache on the computer.
5. If level 3 cache doesn't have the data, the CPU goes to the slower RAM to find it.
6. In the past, level 1 cache was located on the processor.
7. Level 2 cache is larger and faster than level 1 cache.

Task 6. Watch the video again and fill in the gaps in the sentences:

1. DRAM uses capacitors to _____ and these capacitors have to constantly be refreshed with electricity.
2. ……because SRAM doesn't have to be constantly refreshed it is _____ than DRAM and it's also very _____.
3. The CPU cache is the CPU's _____ memory and its job is to store copies of data and instructions from RAM that is waiting _____ by the CPU.
4. The CPU cache acts like a _____ between the CPU and RAM to assist in feeding the CPU the data it needs a lot faster.
5. Level 1 cache is also called _____ cache.
6. Level 2 cache is larger than level 1 cache but it is not _____ level 1 cache.

Task 7. Translate the following sentences from Russian into English:

1. Центральный процессор – это компонент компьютера, который отвечает за интерпретацию и выполнение команд.
2. ЦП используется во всех устройствах, включая планшетные компьютеры и смартфоны.
3. Компании Intel и AMD являются двумя лидирующими производителями процессоров для настольных ПК, ноутбуков и серверов.
4. Блок управления занимается координацией работы всех узлов ЦП.
5. Некоторые устройства используют одноядерный процессор, в то время как другие могут иметь двухъядерный или четырехъядерный процессор.
6. ЦП является самой важной частью современного компьютера, поскольку без команды, которую отдаёт центральный процессор, не происходит выполнение ни одной операции.
7. Кристалл центрального процессора изготавливается из кремния и содержит большое количество микросхем.
8. Кэш ЦП является временным местом хранения данных, которые часто используются.
9. Чем выше тактовая частота процессора, тем больше операций система может обрабатывать за секунду.
10. Тактовая частота процессора не является единственной характеристикой оценки скорости работы ПК. Также требуется учитывать количество ядер и объем кэш-памяти.

UNIT 4: DATA STORAGE

Task 1. Give definitions to the following terms and translate them into Russian:

backup
CD-ROM
CD-R
CD-RW
directory
DVD
USB flash drive
floppy disk
to format
fragmented disk
HDD
laser beam
magnetic storage device
optical disc
to partition
platters
read/write head
seek time
Blu-ray disc
SSD
storage capacity
transfer rate

Task 2. Read the article on data storage and complete the sentences with the following words:

cloud / contents / emerging / encrypt / flash / loss /
offsite / protect / security / theft / volumes

Online storage is an emerging (1) _____ method of data storage and back-up. A remote server with a network connection and special software backs up files, folders, or the entire (2) _____ of a hard drive. There are many companies that provide a web-based backup.

One (3) _____ technology in this area is (4) _____ computing. This allows colleagues in an organization to share resources, software and information over the Internet. Continuous backup and storage on a remote hard drive eliminates the risk of data (5) _____ as a result of fire, flood or (6) _____. Remote data storage and back-up providers (7) _____ the data and set up password protection to ensure maximum (8) _____.

Small businesses and individuals choose to save data in a more traditional way. External drives, such as (9) ____ memory devices or external hard disk drives, are cheap and widely accessible solutions. These methods are very practical with small

(10) _____ of data storage and backup. However, they are not very reliable and do not (11) _____ the user in case of a disaster.

Task 3. Watch the video on Disk Defragmentation at https://www.youtube.com/watch?v=AtRIOUZuI2c and answer the following questions:

1. What is a fragmented disk?
2. What is a defragmented disk?
3. Why do fragmented disks run more slowly?
4. Why is defragmentation not required with SSDs?

Task 4. Watch the video again and complete the blanks:

1. All of your data is spread out and _____ with other data files.
2. ... the defrag will reassemble all of the related _____ that have been broken up and it will put them together in the same physical location.
3. ... and it's also going to put all the _____ on the hard drive together as well.
4. Let's install a program on this _____ hard drive.
5. ... which means that when you want to run one of these programs the computer will _____ because the hard drive doesn't have to do extra work by _____ data from different areas of the hard drive.
6. ... the computer may not be able to find enough free space in one location on the hard drive _____ the program because the free space is _____ in different locations.
7. When you have a fragmented hard drive the computer will _____ ...
8. And after the defrag is _____ the computer will run faster and _____.
9. ... because mechanical hard drives have disks that _____ so that _____ can read and write data files.
10. The computer can just _____ and choose whatever part it needs _____ which memory chip the file is located on.

Task 5. Complete the blanks with the correct prepositions:

on / for / before / by / across / of / than / as / between / to

1. A hard drive can hold hundreds of gigabytes ____ data.
2. Hard drives are very sensitive ____ vibration, especially when they are operating.
3. Cloud computing can also introduce new risks ____ companies using it.
4. The read/write head moves ____ the disk.
5. New disks need to be formatted ____ you can use them.
6. What are the differences ____ flash drives and external hard drives?
7. Formatting erases any existing files ____ a disk.
8. Cloud technology is not necessarily cheaper ____ other forms of computing.
9. The term 'flash memory' was invented ____ Toshiba to express how fast it could be erased – 'in a flash'.
10. External hard drives are typically used ____ backup.

Task 6. Say whether the following characteristics are true for optical storage devices (O) or magnetic storage devices (M):

1. easy and safe to take around
2. slower data reading and writing
3. sensitive to vibration
4. requires laser light to read and write data onto the disc
5. stores data in much higher densities
6. can be readable, writable and re-writable
7. stores data in magnetic form
8. offers lesser capacity
9. magnetic field can destroy the data stored on the disk
10. always readable and re-writable

Task 7. Translate the following sentences from Russian into English:

1. Новые диски нужно отформатировать до начала использования.
2. Облачные технологии позволяют исключить риск потери данных.
3. Жёсткие диски чувствительны к вибрации, особенно во время работы.

4. Форматирование удаляет все существующие файлы на диске.
5. Внешние жёсткие диски обычно используются для резервного копирования.
6. Жёсткий диск может вмещать сотни гигабайт данных.
7. В отличие от оперативной памяти, флэш-память является энергонезависимой.
8. Фрагментация диска происходит в результате многократного создания, изменения и удаления файлов.
9. Не следует подвергать оптические диски воздействию высокой температуры и прямого солнечного света.
10. CD и DVD диски отличаются по внутренней структуре и по объёму хранения данных.

UNIT 5: OPERATING SYSTEMS

Task 1. Give definitions to the following terms and phrases and translate them into Russian:

CLI	proprietary software
to distribute	real-time OS
GUI	to release
multi-tasking OS	source code
multi-user OS	WIMP environment

Task 2. Read the text and answer the questions:

1. What is an operating system?
2. What are the main types of operating systems?

An operating system (OS)

An operating system (OS) is system software that manages computer hardware, software resources, and provides common services for computer programs. Time-sharing operating systems schedule tasks for efficient use of the system and may also include software for accounting of processor time, mass storage, printing, and other resources.

For hardware functions such as input/ output and memory allocation, the operating system acts as an intermediary between programs and the computer hardware, although the application code is usually executed directly by the hardware. Operating systems are found on many devices that contain a computer – from cellular phones and video game consoles to web servers and supercomputers.

The dominant desktop operating system is Microsoft Windows with a market share of about 76.45%. In second place is macOS from Apple Inc. (17.72%), and the varieties of Linux are collectively in third place (1.73%). In the mobile sector (including smartphones and tablets), Android's share is up to 72% in the year 2020. Android's share on smartphones is dominant with 87.5 percent with also a growth rate of 10.3 percent per year, followed by Apple's iOS with 12.1 percent with per year decrease in market share of 5.2 percent, while other operating systems amount to just 0.3 percent. Linux distributions are dominant in the server and supercomputing sectors. For many applications, there are other specialized classes of operating systems such as embedded systems and real-time systems.

Single-tasking and multi-tasking operating systems

A single-tasking system can only run one program at a time, while a multi-tasking operating system allows more than one program to start simultaneously. This is achieved by time-sharing, where the available processor time is divided between multiple processes. These processes are repeatedly interrupted in time intervals by the task scheduling subsystem of the operating system.

Multitasking may be characterized in preemptive and cooperative types. In preemptive multi-tasking, the operating system shares the processor time and allocates a slot for each program. Unix-like operating systems, such as Solaris and Linux—as well as non-Unix-like, such as Amiga OS—support preemptive multitasking. Cooperative multitasking is achieved by allowing each process to provide time for other processes in a specific way. 16-bit versions of Microsoft Windows used cooperative multi-tasking; 32-bit versions of Windows NT and Win9x used preemptive multi-tasking.

Cooperative multi-tasking works perfectly with single-user operating systems because home computers typically run a small number of well-tested programs. Windows NT was the first version of Microsoft Windows to use preemptive multi-tasking, but it didn't reach the home market until Windows XP, because Windows NT was aimed at professionals.

Single- and multi-user operating systems

Single-user operating systems have no facilities to distinguish users, but may allow multiple programs to run in tandem. A multi-user operating system extends the basic concept of multitasking with facilities that identify processes and resources, such as disk space, belonging to multiple users, and the system permits multiple users to interact with the system at the same time. Time-sharing operating systems schedule tasks for efficient use of the system.

Task 3. Read the sentences below and fill in the gaps with the suitable words:

operating / multiple / market / multitasking / characterized

1. Time-sharing _____ systems schedule tasks for efficient use of the system.
2. The dominant desktop operating system is Microsoft Windows with a ____ share of around 76.45%.
3. Multitasking is achieved by time-sharing, where the available processor time is divided between _____ processes.
4. Multitasking may be _____ in preemptive and cooperative types.
5. Cooperative _____ works perfectly with single-user operating systems because home computers typically run a small number of well-tested programs.

Task 4. Find Russian equivalents to the following words and expressions in the text above:

1. intermediary
2. time-sharing
3. embedded
4. memory allocation
5. simultaneously
6. to distinguish

Task 5. Watch a video about the functions of the Operating System at https://www.youtube.com/watch?v=5AjReRMoG3Y and fill in the gaps in the sentences:

1. The memory manager is in charge of the main memory. It scans every request for memory space and checks if it is valid. It allows _____ of memory spaces that are not _____ already.

2. The process manager decides how to allocate the CPU resources. It _____ of the status of each process.
3. The device manager monitors every device, channel and control unit. It looks for the _____ way to allocate all the system devices which are connected to the computer.
4. The file manager checks every type of file that is on the system. It _____ so that certain users can only see certain files.
5. The network manager provides a way for users _____ hardware and software resources while also controlling _____ to them.

Task 6. What do you know about open-source software? How is it different from proprietary software? Think about cost, who writes it and how much people use it. Read this web article and check your answers:

Open-source software

With open-source software, what do people think first? Money, usually because open-source software is cheaper or free. But this is not the only reason. First there is freedom from the software vendors. Organizations say that freedom is the number one reason to choose open-source software. With open-source software, an organization doesn't have to follow the software vendor's decisions. Anyone can study and modify the open-source code. With proprietary software the vendor controls software updates and users can't add features to proprietary software themselves.

Sometimes people worry about open-source operating systems. They think that some software they use won't run on open-source operating system. However, this isn't true because there is a lot of office software, such as word processors and spreadsheets for open-source operating systems. In fact, there are many kinds of this software and they work well. It is only special areas, such as graphics design, where proprietary software is clearly better.

Task 7. Find synonyms to the following words and expressions in the text above:

a) more affordable
b) sellers
c) to select
d) to alter
e) patented
f) to feel anxious

Task 8. Fill in the gaps with appropriate prepositions:

by / between / to / from / on / of / under / than / to / over

1. CLI is still used ____ software developers and system administrators to configure computers, install software, and access features that are not available in the graphical interface.
2. An operating system is a set of programs that lies ____ application software and the computer hardware.
3. Linux is open-source software developed ____ GNU General Public License.
4. What are the benefits of CLI ____ GUI?
5. In case of open-source software, you can adjust a program ____ your needs.
6. GUI is more user-friendly, more convenient to use ____ the command line interface since it uses WIMP environment.
7. Apart ____ the fact that it's freely distributed, Linux's functionality, adaptability and robustness has made it the main alternative ____ proprietary Unix and Microsoft operating systems.
8. The dominant general-purpose desktop operating system is Microsoft Windows with a market share ____ around 77%.
9. One of the functions of an OS is booting, which is the process of turning ____ the computer and powering up the system.

Task 9. Match the heads and the tails of sentences related to the work of an OS:

1	The OS is in charge of keeping data	*a*	and coordinating the computer applications and allocating space for programs.
2	Memory management is the process of controlling	*b*	errors and avoid the malfunctioning of computer system.
3	A multi-tasking OS allows more than	*c*	safe inside your computer.
4	Operating system constantly monitors the system to detect	*d*	delay, making information up-to-date, e.g. ticket reservation systems.
5	A real-time OS processes data without significant	*e*	one program to run at the same time.

Task 10. Translate the following sentences from Russian into English:

1. Linux - это семейство операционных систем с открытым исходным кодом, выпущенное под лицензией GNU.
2. Windows может изменяться и распространяться только самим разработчиком.
3. Некоторые лицензионные программы не работают на операционных системах с открытым исходным кодом.
4. Большая часть работы операционной системы скрыта от пользователя.
5. Операционная система действует как посредник между программами и аппаратным обеспечением компьютера.
6. Операционные системы распределяют задачи для эффективного использования возможностей компьютера.
7. Хотя в современных операционных системах с графическим интерфейсом навигация происходит с помощью компьютерной мыши, в некоторых программах применяется командная строка.
8. Однозадачная система может одновременно запускать только одну программу, тогда как многозадачная операционная система позволяет запускать несколько программ в одно и то же время.
9. Операционные системы для мобильных устройств уступают по функциональности операционным системам для стационарных компьютеров.
10. По сравнению с графическим пользовательским интерфейсом, интерфейс командной строки требует меньше системных ресурсов для работы.

UNIT 6: NETWORKS

Task 1. Give definitions to the following terms and phrases and translate them into Russian:

Bluetooth
client-server network
GSM
Internet Service Provider
ring topology
Satellites
star topology
Wi-Fi

network nodes	WiMAX
network protocol	wired modem router
network topology	wireless LAN
peer-to-peer network	hub

Task 2. Read the text "Networks" and answer the questions:

1. What is a computer network?
2. What types of networks are mentioned in the text?

Networks

A network is a collection of computers, servers, mainframes, network devices, peripherals, or other devices connected to one another to allow the sharing of data. An example of a network is the Internet, which connects millions of people all over the world. Typical network configurations include the bus topology, mesh topology, ring topology, star topology, tree topology and hybrid topology. In general, the more interconnections there are, the more robust the network is; but the more expensive it is to install. Let's have a look at the distinct features of the network topologies mentioned above:

- Bus network: all nodes are connected to a single cable that acts as the backbone of the entire network. There is no limit to the number of nodes that can be connected to this network.
- Star network: all nodes are connected to a special central node. This is the typical layout found in a Wireless LAN, where each wireless client connects to the central wireless access point.
- Ring topology: each device/node is connected with its neighboring node forming the shape of a ring, hence its name. In ring topology, data circulates from one computer to another. The flow of data in ring topology can be uni-directional or bi-directional.
- Mesh topology: a network topology in which the infrastructure nodes (i.e. bridges, switches, and other infrastructure devices) connect directly and non-hierarchically to as many other nodes as possible.
- Tree topology: all the computers are connected like the branches of a tree. In computer networking, tree topology is known as a combination of a bus and star network topologies. The main advantages of this topology are better flexibility and scalability.
- Hybrid topology: this type includes a mix of bus topology, mesh

topology, ring topology, star topology, and tree topology. The combination of topologies depends on the need of a company.

Public networks and private networks

Often offered by nearby businesses and other publicly accessible areas, public networks are a convenient way to connect to the Internet.

Some public Wi-Fi networks require a password before a connection is made. If the network displays a lock icon in your list of available Wi-Fi networks, it requires a password. Some networks do not require a password to connect, but require you to log in using your web browser before you can access the Internet.

Other public networks do not require a password at all. Any compatible device may connect to these Wi-Fi networks without authentication.

All public networks are less secure than your home network. Even if the websites you visit use encryption, the URLs you visit can be eavesdropped. For this reason, you should not transmit private or sensitive information on a public Wi-Fi network if you can do it elsewhere. If a public network does not require a password, it is recommended not to connect any of your devices to it.

A private network is a computer network that uses private IP address space and has security measures in place to prevent unwanted or unauthorized connections. Private networks are often used for homes, business, or school Wi-Fi networks to ensure security and to preserve bandwidth.

What was the first computer network?

Computer networking may be considered a branch of computer science, computer engineering, and telecommunications, since it relies on the theoretical and practical application of the related disciplines. Computer networking was influenced by a wide array of technology developments and historical milestones.

One of the first computer networks to use packet switching, ARPANET was developed in the mid-1960s and is the direct predecessor of the modern Internet. The first ARPANET message was sent on October 29, 1969. The Advanced Research Projects Agency Network (ARPANET) was the first wide-area packet-switching network with distributed control and one of the first networks to implement the TCP/IP protocol suite. Both technologies became the technical foundation of the Internet.

Task 3. Read the sentences below and fill in the gaps with the suitable words:

communication protocols / computers / network nodes / sharing / telecommunication/ topologies

A computer network is a group of (1)_____ that use a set of common (2)____ _____ over digital interconnections for the purpose of (3) _____resources located on or provided by the (4)_____ _____. The interconnections between nodes are formed from a broad spectrum of (5)_____ network technologies, based on physically wired, optical, and wireless radio-frequency methods that may be arranged in a variety of network (6)_____.

computers / hostnames / hardware / addresses / protocol

The nodes of a computer network may include personal (7)_____, servers, networking (8)_____, or other specialized or general-purpose hosts. They are identified by (9)_____ and network addresses. Hostnames serve as memorable labels for the nodes, rarely changed after initial assignment. Network (10)_____ serve for locating and identifying the nodes by communication (11) _____ such as the Internet Protocol.

Task 4. Discuss the meaning of the following words:

1. digital interconnections
2. telecommunication network technologies
3. hotspot
4. cellular networks
5. hostnames
6. network addresses
7. file sharing

Task 5. Translate the following sentences from Russian into English:

1. Компьютерная сеть использует набор протоколов связи и дает возможность совместного использования ресурсов.

2. Телекоммуникационная сеть даёт возможность получить необходимую информацию для обеспечения деятельности фирмы или удовлетворения личных потребностей пользователя.
3. Локальные сети подходят для использования на небольшой территории, например, в офисе.
4. Компьютерная сеть может состоять из персональных компьютеров, серверов и сетевого оборудования.
5. На создание компьютерных сетей повлиял широкий спектр технологических разработок и исторических событий.
6. ARPANET является прямым предшественником современного Интернета.
7. Данные технологии стали технической основой для создания Интернета.
8. В частных сетях предусмотрены меры безопасности для предотвращения нежелательных или несанкционированных подключений.
9. Некоторые сети не требуют пароля для подключения, но требуют, чтобы пользователь вошел в систему с помощью веб-браузера, прежде чем сможет получить доступ к Интернету.
10. Интернет состоит из большого количества локальных и глобальных сетей, связанных между собой с использованием различных проводных и беспроводных технологий.

Task 6. Read the sentences below and fill in the gaps with the suitable words:

topology / medium / network / criteria

Computer networks may be classified by many (1) _____, for example, the transmission (2) _____ used to carry signals, bandwidth, communications protocols to organize (3) _____ traffic, the network size, (4)_____, traffic control mechanism, and organizational intent.

digital / applications / services / storage / instant / machines

Computer networks support many (5)_____ and (6)_____, such as access to the World Wide Web, (7)_____ video, digital audio, shared use of application and (8)_____ servers, printers, and fax (9)____, and use of email and (10) ____ messaging applications.

Task 7. Read the sentences below and fill in the gaps with the suitable words:

online /interpersonal/ technologies / resources /conferencing / shared /authorized

A computer network extends (1)_____communications by electronic means with various (2)_____, such as email, instant messaging, (3)_____chat, voice and video telephone calls, and video (4)_____. A network allows sharing of network and computing (5)_____. Users may access and use resources provided by devices on the network, such as printing a document on a (6) _____ network printer or use of a shared storage device. A network allows sharing of files, data, and other types of information giving (7)_____users the ability to access information stored on other computers on the network.

Task 8. Complete these sentences with the words:

wireless access point / modem / bridge / gateway / router

1. A _____ connects networks that use the same protocol.
2. A _____ connects two networks which use different protocols.
3. A _____ connects networks and sends packages of data between them.
4. A _____ allows wireless devices to connect to the network.
5. A _____ modulates and demodulates the data into a digital or an analog signal.

Task 9. Watch a video on different types of network topologies at https://www.youtube.com/watch?v=zbqrNg4C98U ***and make a list of network topologies mentioned in the video.***

Task 10. Watch the video again and answer the questions:

1) What are the advantages and disadvantages of a star topology?
2) What are the advantages and disadvantages of a ring topology?

Task 11. Fill in the gaps using the following words:

backbone / centralized / layout / redundancy

Network topology is the (1)_____ of a network. In a bus topology, all the

computers are connected to a single cable or (2)_____. In a mesh topology, each computer on the network is connected to every other computer. It creates a high (3)_____ level and handles failure very well because the data can be rerouted over a different path to finally reach its destination. In an ad hoc topology, all the devices are wirelessly connected to each other in a single peer-to-peer network without using (4)_____ device.

UNIT 7: THE INTERNET

Task 1. Give definitions to the following terms and translate them into Russian:

copper twisted-pair cable
fiber-optic cables
coaxial cable
Digital Subscriber Line
dial-up connection
bandwidth
broadband access
to broadcast
attenuation of a signal
cell sites
radio frequencies
power-line Internet
to surf the Net
transceiver
Internet Protocol Suite
hypertext-based system
terrestrial access
Satellite Internet access
cellular network

Task 2. Read the text 'How to get access to the Internet' and answer the questions:

1. What does ADSL stand for? Why is this type of connection called asymmetric?
2. What is the difference between a dial-up connection and DSL?
3. What is the origin of the term 'dial-up connection'?
4. What is the downside of cable Internet?
5. What types of wireless Internet connections are mentioned in the text?
6. How is data transferred over fiber-optic cables?
7. What equipment does one need to get access to the Internet through satellite systems?

How to get access to the Internet

DSL

Digital Subscriber Line (DSL) is a high-speed Internet connection, which utilizes the standard telephone lines, but allows digital signals to be carried rather than analogue. It allows the full bandwidth of the copper twisted-pair telephone cabling to be utilized. The DSL signal is pulled out from the phone line as it enters the premises and is wired separately to a DSL modem. DSL service can be delivered simultaneously with wired telephone service through the same telephone line since DSL uses higher frequency bands for data transmission.

The most commonly installed DSL technology for Internet access is ADSL (Asymmetric Digital Subscriber Line). It is asymmetric because the download speed is faster than upload speed. DSL-based services are a low-cost option when compared to other solutions offering similar bandwidth, so they can be made available to customers at extremely competitive prices.

Although DSL makes use of telephone cabling, it should not be confused with the dial-up connection of yesteryear. A dial-up connection to the Internet is set up by dialing a phone number, hence the name. Since the same frequency is used to carry voice and data signals over the copper telephone wire, only one service can be provided at a time and it is impossible to use the phone to make calls and browse the Internet at the same time.

Cable Internet

Cable Internet is a form of broadband Internet access that uses the infrastructure of cable TV networks to provide Internet services. It is integrated into the cable television infrastructure analogously to DSL, which uses the existing telephone network. Since TV itself takes up only a small portion of the cable's bandwidth, it leaves room for Internet access to be provided through the same network.

First, your Internet Service Provider sends a data signal through the coaxial cable into your home — specifically, to a cable modem. The cable modem then connects to your computer and other devices via an Ethernet cable or through Wi-Fi network using a Wi-Fi router.

A cable connection is highly reliable and is not subject to outages due to storms, like satellite Internet. However, since residential cable Internet access is provided through shared bandwidth, which everyone in the neighborhood uses, the speed can be slower during peak usage hours when a lot of Internet users are online. This does not happen with a DSL network, which keeps a consistent Internet signal

because each subscriber has their own dedicated line.

Fiber-optic Internet

Fiber-optic Internet uses fiber-optic cables instead of copper wires and it is incredibly fast. Those cables send data to and from a computer by harnessing the power of light and can carry data over long distances with low attenuation and distortion of the light signal. That light signal uses binary system to communicate with computers. The presence of light indicates a binary one and the absence of light indicates a binary zero. Fiber-optic cables transfer data faster than copper wiring, which means faster load times and higher-quality streaming.

Wireless connection

The three wireless technologies widely used today are Wi-Fi, cellular and satellite Internet. Wi-Fi uses radio waves to wirelessly connect devices and is commonly applied for local area networking. To get access to the Internet, a device (a tablet or a smartphone) has to be connected over Wi-Fi to a wireless router.

Internet over Satellite usually allows a user to access the Net via a geostationary satellite that orbits the Earth. As signals must travel long distances from the Earth up to the satellite and back again, it may cause a delay between the request and the answer. However, modern technologies make it possible to minimize this latency. Thus, satellite Internet access can provide high-speed Internet where the conventional cable or DSL is either not available or not functioning well. To get access to the Internet, one needs a satellite dish for two-way (upload and download) data communications and a modem.

A cellular network is a communication network distributed over land areas called "cells". Each cell has at least one fixed-location transceiver, but more commonly, there are three cell sites. These base stations (cell towers) provide a cell with the network coverage, which can be used for transmission of voice and data. A cell typically uses a different set of frequencies from the neighboring cells to avoid interference and provide guaranteed service quality within each cell.

Task 2. Find English equivalents for the following words and expressions in the text:

1) одновременно
2) помещение
3) цифровой сигнал
4) конкурентные цены

5) дешевый вариант
6) надежный
7) стабильный/ устойчивый сигнал
8) выделенная линия
9) искажение сигнала

Task 3. Watch a video on different types of Internet access at https://www.youtube.com/watch?v=qQYiwmamq38 and fill in the gaps in the sentences below:

1) Cable Internet is a _____ access technology that uses a cable modem with an _____ coaxial cable.
2) Internet Service Providers offer different packages that _____ in speed.
3) A modem with a Wi-Fi router combo is often referred to as a _____.
4) The _____ of the cable Internet is that you have to share a pool of bandwidth with your neighbors.
5) One shouldn't _____ DSL with the older and slower _____ _____which also uses phone lines.
6) Everyone using DSL has their own _____ connection, so you don't have to share bandwidth with your neighborhood.
7) The three types of DSL connections mentioned in the video are ADSL, _____ and _____.
8) Fiber-optic cable is used as the _____ of the Internet.
9) Signals in a copper cable can be affected by _____ _____ which can weaken the signal.

Task 4. Read the text and fill in the gaps using the words and phrases below:

The World Wide Web

accessed / referred / hyperlinks / a set of instructions / synonymous / click / scientist / web browser / up-to-date / everyday / outside

The World Wide Web (WWW), commonly (1)___ to as the Web, is an information system accessible through the Internet where documents and other web resources are identified by a Uniform Resource Locator (URL). The Resources of the Web can be (2) ___ through a software application called a web browser. The Web is

a hypertext-based system (hypertext is a text that contains (3) ____ to other documents). You can (4)___ on keywords or buttons that take you to other pages or other websites. This is possible because browsers understand Hypertext Markup Language (HTML), (5) ____ used to indicate how a web page is formatted and displayed.

The World Wide Web is not (6) _____ with the Internet, which pre-existed the Web and upon which the Web is built. English (7) _____ Tim Berners-Lee invented the World Wide Web in 1989. He wrote the first (8) _____ in 1990 while employed at CERN near Geneva, Switzerland. The browser was released (9) _____ CERN to other research institutions in January 1991, and then to the general public in August 1991. The Web began to enter (10) _____ use in 1993/ 1994, when websites for general use started to become available. Nowadays the Web serves billions of users worldwide, as it is one of the best resources for (11) _____ information.

Task 5. Answer the questions to the text above:

1) What does URL stand for?
2) Who invented the World Wide Web?
3) When did the Web enter everyday use?
4) What does HTML stand for? What is this language used for?

Task 6. Translate the following sentences from Russian into English:

1. Спутниковый Интернет является хорошим решением для сельских районов, где нет телефонных линий.
2. Технология Wi-Fi использует радиоволны, чтобы передавать сигнал.
3. Технологии доступа к Интернету постоянно меняются и совершенствуются.
4. Модем преобразовывает цифровой сигнал в аналоговый и наоборот, чтобы данные можно было передать по телефонным линиям.
5. Цифровая абонентская линия является более быстрым вариантом доступа к Интернету, чем коммутируемый доступ.
6. Сотовая сеть использует специальные базовые станции для передачи сигнала.
7. Всемирная паутина является одним из лучших источников последней информации.
8. Оптоволоконный кабель имеет значительные преимущества по сравнению с медным проводом.

9. Протокол передачи файлов (FTP) был разработан для передачи данных между клиентом и сервером.
10. Стек протоколов TCP/IP – это сетевая модель передачи данных, которая предполагает прохождение информации через 4 уровня, каждый из которых описывается правилом (протоколом передачи).

Task 7. Read the text and fill in the gaps with the word below:

ensures / piece / rerouted / includes / congestion / amount / broken down / destination/ reliable / determined

In telecommunication, a packet is a small (1) _____ of data sent over a network, such as a LAN or the Internet. When a user sends a file across a network, it is not transferred as one (2) ____. In fact, it gets (3) _____ into smaller data packets and this technology (4) _____ reliable and efficient data transmission. So, if a data transfer encounters network (5) _____ due to multiple simultaneous transfers, some packets can be (6) _____ through a less congested path. When the packets reach their (7) _____, they are reassembled into a single file by the computer that receives them.

The packet size is typically (8) _____ by the type of protocol used. Ethernet packets can be around 1.5 KB, whereas IP packet average size is 64 KB. Similar to a real-life package having a source and destination, each network packet (9) _____ the origin IP address, the destination IP address, the number of packets in the entire data file, and the sequence number to guarantee the (10) _____ data transmission.

Task 8. Read the text 'Email Protocols' and find the answers to these questions:

1. What are the three email protocols mentioned in the text?
2. Which email protocol is used to transfer messages between server computers?
3. What happens to a message once it has been delivered in case of SMTP protocol?
4. Why does POP3 allow you to reduce the space your email account uses on the mail server?
5. What are the disadvantages of using POP3?
6. What are the advantages of using the IMAP protocol?

Email Protocols

Although the format of an email message, as transmitted from one machine to another, is rigidly defined, different email protocols transfer and store messages in slightly different ways. The email system you're probably used to employs a combination of SMTP and IMAP to send and receive mail respectively. Others may use POP3 to retrieve mail.

Simple Mail Transfer Protocol (SMTP) is used for sending email over the Internet. Email clients (such as Outlook, Mail.ru, Gmail, Yandex) use SMTP to transfer messages to the mail server and the mail server uses SMTP to relay that message to the correct receiving server. Once a message has been delivered, it can't be recalled or cancelled. It's also deleted from the sending server once it's been delivered.

Post Office Protocol (POP) allows you to download email messages on your local computer and read them even when you are offline. Note, that when you use POP3 to connect to your email account, messages are downloaded locally and removed from the email server. This means that if you access your account from multiple devices, that may not be the best option for you. On the other hand, if you use POP3, your messages are stored on your local computer, which reduces the space your email account uses on the web server.

Internet Mail Access Protocol (IMAP) is similar in operation to POP3, but allows you more choice over what messages you download. Initially, only message headers are retrieved, giving information about the sender and subject. You can then download just those messages you want to read and delete individual messages from the server. Another great advantage of IMAP over POP3 is the opportunity to organize your mail into folders. Thus, there is less danger of losing messages.

While POP3 assumes that your email is being accessed only from one device, IMAP allows simultaneous access by multiple clients. This is why IMAP is more suitable for you if you’re going to access your email from different devices (your desktop PC, tablet, smartphone) or if your messages are managed by multiple users.

Task 9. Find the English equivalents of the following expressions in the text above:

1. передать сообщение
2. получить сообщение
3. доставить сообщение
4. загрузить сообщение
5. удалить сообщение
6. получить доступ к своей учётной записи электронной почты
7. одновременный доступ

Task 10. Watch a video on the difference between POP3 and IMAP at https://www.youtube.com/watch?v=SBaARws0hy4 and say whether the following statements are true or false:

1. POP3 is used for sending email to the email server.
2. POP3 doesn't download any of your folders but the inbox folder.
3. In POP3 mail isn't deleted from the server once it is downloaded to a device.
4. Both IMAP and POP3 synchronize all the folders on multiple devices.
5. POP3 is suitable if you check your email from one device.
6. POP3 saves storage space on the mail server.

Task 11. Fill in the gaps with correct prepositions:

with / from / over / between /through /of / into / with / by

1. In POP3 mail is deleted _____ the server once it is downloaded to a device.
2. DSL service can be delivered simultaneously _____ wired telephone service over the same telephone line.
3. Data is transmitted in small chunks called packets so that they can individually take the quickest route _____ the Internet to reach their final destinations.
4. The Internet is a worldwide computer network that transmits a variety ___ data and media across interconnected devices.
5. An IP address is a series of four numbers separated _____ dots, for example: 192.168.2.10.
6. TCP/ IP specifies how data is exchanged over the Internet and how it should be broken down ____ packets, transmitted and received at the destination.
7. Transmission Control Protocol guarantees the delivery of data _____ an acknowledgement.
8. Different types of fiber-optic cables are used for long distance telecommunication, or for providing a high-speed data connection _____ different parts of a building.
9. TCP/ IP Protocol Stack is compatible _____ all operating systems and all types of computer hardware.

UNIT 8: SEARCH ENGINES

Task 1. Give definitions to the following terms and translate them into Russian:

search engine	search bar
database	bookmark
URL	index
query	homepage
relevant results	keywords

Task 2. Read the text "Types of Search Engines" and translate it into Russian:

Types of Search Engines

A search engine allows users to extract requested information from the huge database of resources available on the Internet. Internet usage has increased tremendously in the recent years with the easy to use search engines like *Google, Bing* and *Yahoo!* Optimizing websites for *Google* and other search engines is essential for any website owner if they want to reach a larger audience. Studies suggest that when using search engines, most people do not go beyond the listings mentioned on the first couple of pages of the search engine results list.

Search engines can be classified into the following three categories:

1. Crawler-based search engines
2. Human-powered directories
3. Meta-Search engines

1. Crawler-Based Search Engines

There are three basic steps that every crawler-based search engine follows before displaying search results:

- Crawling
- Indexing
- Ranking

<u>Crawling</u>

Crawler-based search engines create their listings automatically by using a

special program known as ‘a crawler’ or ‘a spider’ to find new and updated content. Content can vary – it could be a webpage, an image, a video – but regardless of the format, content is discovered by links. For example, *Googlebot* starts out by fetching a few webpages and then follows the links on those webpages to find new URLs. Various data mining techniques are used to define which pages should be crawled and the crawling frequency. Every time a web crawler finds a new website through a link, it scans and passes its content for further processing (called indexing).

Indexing

Search engines process and store information they find in an index - a massive database of discovered URLs – to be retrieved later when a user enters a query. Indexing is performed by identifying the words and expressions that best describe the page. The identified words are referred to as keywords and the page is assigned to the identified keywords.

Ranking

Search engines compare the search string with the indexed pages from the database to provide the content that will best answer the user’s query. The results are ordered from most relevant to least relevant. This ordering of search results by relevance is known as ranking. There are various algorithms to calculate relevancy, which is why different search engines give different search results for the same search string. These algorithms are constantly evolving to provide users with most relevant search results.

2. Human-Powered Directories

Human-powered directories depend on human editors to compile their listings. This means that they only show results for content that is added manually. Here is the way the indexing in web directories works:

- A short description along with the URL of the website is submitted to the directory for approval.
- Submitted site is then manually reviewed and added in the appropriate category or rejected for listing.
- Keywords entered in the search box will be matched with the description of the site. This means that changes made to the content of a webpage are not taken into consideration as it is only the description that matters.

Yahoo! Directory, Open Directory and *LookSmart* can serve as good examples of web directories. However, automated search engines like *Google*, have nearly wiped out

those human-based directories out of the web.

3. Meta-Search Engines

A meta-search engine does not have a database of indexed pages of its own. Instead, it sends users' queries to several other search engines and compiles top results from each into one overall list. After redundancy removal, these results are processed, ranked and presented to the user.
Dogpile, MetaCrawler, and *SavvySearch* are a few examples of such meta-search engines.

Task 3. Answer the following questions:

1. What is a search index?
2. Why are keywords important for indexing of web pages?
3. How is the database created in human-powered directories?
4. How are crawler-based search engines different from human-powered directories?
5. How do meta-search engines work?

Task 4. You are going to watch a video on search engines. Match the verbs (1-6) with the nouns or phrases (a-f) to make collocations, then watch the video at https://www.youtube.com/watch?v=LVV_93mBfSU and check your answers:

1. lead	a) with results
2. collect	b) algorithms
3. come up	c) a team
4. update	d) web pages
5. rank	e) one's search
6. narrow down	f) information

Task 5. Watch the video again and fill in the gaps with the missing words or phrases:

1. Let's _____ and see how the search engine turns your _____ into a result. To make your search faster, search engines are constantly _____ the Web in advance to record information that might help with your search later.

2. Search engines are constantly running a program called *a spider* that _____ through web pages following hyperlinks. The information this program collects is added to a special database called _____.
3. Each search engine uses its own algorithm to rank the pages _____ what it thinks you want. The search engine ranking algorithm might check if your search term shows up in the page _____ or it might check if all the words show up _____.
4. *Google* invented an algorithm that takes into _____ how many other web pages are linked to a _____ page.
5. Search programs are always _____ to improve the algorithm so that they return better and faster results than their _____.

Task 6. Read the text below and fill in the gaps with the most suitable words or phrases from the list.

What are the alternatives to Google?

Google is a globally recognized search engine and an industry giant. But even if it's the biggest and most well-known, it doesn't mean it's your only choice. One of the main reasons that people choose to use an alternative search engine instead is for increased privacy, as Google is known to track user data both for its own and third-party use.

Bing

internal features / pretty handy / versatile tool / catch up

Microsoft's Bing has become an alternative search engine option for many people today. It's easy to use and provides beautiful background photos. Just like Google, Bing is full of (1)_____ like currency conversion, translation, and flight tracking, making it a really (2)_____ that holds its niche in the global market. While you're likely familiar with Bing, you might not know that it offers a Rewards scheme. When you shop or search through Bing, you earn points that can be put towards purchasing apps and movies, which is (3)_____.

Bing has recently been trying to (4)_____with Google in the advertising space, adding a number of features to Bing Ads. While Bing doesn't have the market share that Google does, it is still popular in many markets including the U.S. and the U.K.

Baidu

censored / was founded / similar to / per day / downside

Baidu (5)_____ in 2000 and is the dominant search engine in China with a market share of over 70 percent. Although in Mandarin, it is strikingly (6) _____ Google in terms of design. However, Baidu is heavily (7)_____. Certain images and even pro-democracy websites are blocked on the search engine. Outside of China, Baidu holds little influence. But within the country, Baidu powers 3.3 billion searches (8)_____.

The (9)_____ to Baidu is that it only gives access to one market. The upside is that the market it gives access to is huge. That said, it's crucial for businesses to understand that accessing the Chinese market is not like accessing any other. The visuals, verbiage and customs are entirely different and Google Translate isn't going to help you win any customers over. To access the Chinese market via Baidu, you need someone on staff who speaks the language and understands the culture.

Ecosia

towards / renewable energy / on average

Heavy search engine usage has a considerable impact on CO_2 emissions. That is where Ecosia comes in: the CO_2 neutral alternative search engine. Their servers run on 100% (10)_____ and they use their profit to plant trees. About 80% of their ads revenue goes (11) _____ the tree-planting scheme. (12)_____, roughly 45 searches are needed to plant a single tree.

Yandex

went public / holds / user-friendly / was adopted

Yandex is used extensively in its native Russia, where it (13) ____ around 60% of the search engine market share. It provides a very similar service to Google, and

you can search websites, images, videos, and news in a (14) _____ layout. It also has additional features including mobile apps, maps, translation, cloud storage and more.

Yandex has its roots in a project started by two Russian developers to aid in the classification of patents in 1990. The term Yandex (15)_____ in 1993 standing for "**Y**et **A**nother i**NDEX**er." The Yandex.ru domain was launched in 1997. In 2011, they (16)_____ on the New York Stock Exchange with an IPO (initial public offering) of $1.3 billion making it the second largest at the time (right after Google). Yandex currently powers more than half of all searches in Russia.

Disconnect Search

enter / functions / rerouted

Disconnect Search is a tool that allows you to conduct anonymous searches through a search engine of your choice. When you (17)_____ a search term, your query is (18)_____ and anonymized through Disconnect's servers before being passed on to the search engine you selected. This allows you to use your favorite search engine without any privacy issues. Disconnect also offers browser extensions and apps that allow you to block tracking sites, load pages faster and some other privacy-based (19)_____.

Search Encrypt

erases / be tracked / encryption

Another privacy-based search engine is Search Encrypt, which uses (20)_____ to ensure that users' identifiable information cannot (21)_____. As a metasearch engine, Search Encrypt gets its results from a network of search partners, providing well-rounded results that aren't personalized to your history. A really interesting feature of this search engine is that it automatically (22)_____ your local browsing history after 15 minutes of inactivity. This means that you never have to worry about your privacy, even if someone else has access to your computer.

Task 7. Answer the questions:

1) What is peculiar about Ecosia?
2) What is the downside of Baidu?

3) Which privacy-based search engines are mentioned in the text?
4) Why is Bing called a versatile tool?
5) How was the term ‘Yandex’ coined?

Task 8. Read the text below and fill in the gaps with the correct preposition or adverb from the list:

in / for / to / of / of / with / down / on / for

What is SEO?

SEO stands (1) ___ Search Engine Optimization. It refers (2)__ a set of improvements that help your website to rank higher in Search Engine Results Page (SERP). In short, it is all about getting users to visit your site without directly paying (3)___ advertising. SEO is incredibly important as websites on the first page of search results receive the majority (4) ___ clicks. The number of people clicking a website (click-through rate) decreases the further (5) _____ the page they rank.

SEO is a fundamental part (6) ____ digital marketing because people conduct millions of searches every day, often (7) ____ intent to find information about products and services. Greater visibility and ranking higher (8) ___ search results than your competitors can have a material impact (9) ___ your revenues.

Task 9. Translate the sentences into English:

1. Большинство владельцев компаний стараются оптимизировать свои вебсайты для Google, т.к. это самая популярная поисковая система.
2. Разные поисковые системы используют разные алгоритмы для сбора и обработки информации, размещенной в сети.
3. Метапоисковая система – это поисковый инструмент, посылающий запрос пользователя одновременно в несколько поисковых систем и каталогов.
4. Собрав результаты, метапоисковая система удаляет ссылки, которые дублируются, и ранжирует результаты поиска в соответствии с применяемым алгоритмом.
5. Некоторые люди предпочитают использовать поисковые системы, которые обеспечивают наибольшую конфиденциальность.
6. Поисковые системы ежедневно проводят рутинную работу по поиску, хранению и сортировке информации.

7. Алгоритмы поисковых систем постоянно меняются и совершенствуются.
8. Поисковые роботы (пауки) – это программы, которые в автоматическом режиме посещают сайты и собирают информацию.
9. Индексация – это процесс занесения информации в базу данных поисковых систем.
10. Введя один и тот же запрос в поисковые строки разных поисковиков, можно получить разные ответы.

UNIT 9: TYPES OF MALWARE AND DATA SECURITY

Task 1. Give definitions to the following terms and translate them into Russian:

adware	to infiltrate	salami shaving
backdoor	IP spoofing	security measures
cybercrime	keylogger	spyware
Ddos attack	malware	Trojan
to encrypt data	phishing	unauthorized access
firewall	piggybacking	unwanted request
hacker	piracy	worm

Task 2. Read the magazine article and choose the correct answers:

1 What's the main purpose of the article?

A to describe the types of viruses and other harmful programs
B to explain how to avoid viruses
C to stress the importance of having anti-virus software
D to alert readers to the existence of a new virus type

2 How is a Trojan horse different from a virus?

A It attaches to another program.
B It is harmful to your computer.
C It does not replicate itself.
D It spreads via a network.

Viruses

The fear that a virus may infect your computer is a familiar one for many. Even casual computer users know that unfamiliar files may host viruses.

While viruses are a well-known threat, many computer users do not know their enemy. There are many specific types of viruses that one needs to guard against.

One dangerous type of virus is an overwriting virus. These viruses not only spread malicious code, they also replace the information contained in other programs. They erase important information, sometimes rendering a computer entirely unusable.

Another common virus is a resident virus. They stay dormant until a particular event activates them. If your computer harbors resident viruses, you may not discover them until the damage is done.

A Trojan horse is another destructive type of program. It's not technically a virus because it doesn't replicate itself, but it's still dangerous. A Trojan horse looks like an ordinary, useful file or program. However, it has destructive programming embedded in it. This programming may also piggyback onto beneficial files. Lastly, unlike viruses and Trojan horses, a worm does not need to attach itself to another program.

Task 3. Match the words or phrases (1-6) with the definitions (A-F):

1. virus	a) a virus that erases information by replacing it
2. host	b) a computer or program that carries a virus
3. to embed	c) a virus that is dormant until activated
4. resident virus	d) a harmful program that infects a computer
5. to piggyback	e) to attach to another program for transferring
6. overwriting virus	f) to plant a harmful program within an ordinary program

Task 4. Complete the blanks with the correct prepositions:

into / from / in / with / like / without / of / to / by / until

1. A resident virus stays dormant _____ a particular event activates it.
2. The firewall inspects each packet using a set _____ filters.
3. A Trojan horse looks _____ an ordinary, useful file or program.

4. These viruses not only spread malicious code, they also replace the information contained _____ other programs.
5. A worm does not need to attach itself _____ another program.
6. An overwriting virus erases information _____ replacing it.
7. A hacker is someone who tries to break _____ a computer system.
8. We aren't permitted to download files from the Internet _____ authorization.
9. What are some ways to protect yourself _____ identity theft?
10. Since pretexting is a serious crime, and we are working _____ federal police to stop it.

Task 5. Read the sentences and choose the correct words:

1. A **Trojan horse / worm** appeared to be a harmless video editing program.
2. Software that sends information about the use of a computer system is called **spyware / ransomware**.
3. **A keylogger / Adware** is software that automatically plays commercials on a computer.
4. A worm could **replicate / infect** itself and spread its copies to other computers.
5. **Salami shaving / Piggybacking** is using the Internet connection without any payment or permission by means of getting attached to another user.

Task 6. Read the text below and fill in the gaps with the following words:

intervention / standalone / infect / dormant / triggered / malicious code / host file

Virus vs Worm

The main difference between a virus and a worm is that viruses must be (1) _____ by the activation of their host, whereas worms are (2) _____ malicious programs that can self-replicate and propagate independently as soon as they have breached the system. Worms do not require activation - or any human (3) _____ - to execute or spread their code.

Viruses are often attached or concealed in downloaded files. When the host file is accepted by a system, the virus remains (4) _____ until the infected host file is activated. Only after the host file is activated, the virus can run, executing (5) _____ and replicating itself to infect other files on the computer.

In contrast, worms don't require the activation of a (6) _____. Once a worm has entered the system, usually via a network connection, it can run, self-replicate and propagate without a triggering event. A worm makes multiple copies of itself, which then spread across the network. These copies will (7) _____ any inadequately protected computers and servers that connect - via the network or internet - to the originally infected device.

Task 7. Watch a video on different types of malware at https://www.youtube.com/watch?v=n8mbzU0X2nQ answer the questions below and complete the blanks:

a) What are the three common ways for malware to enter your computer?
b) What activates viruses existing on your system?
c) What is the harmful effect of ransomware?
d) How do worms operate?
e) What is the difference between viruses and worms?

1. Malware can make entry onto your computer via _____ _____ _____, visiting _____ websites …
2. Viruses often _____ on the Internet and _____ when downloading a file infected with a virus.
3. A Trojan is a _____ piece of software that looks _____.
4. Ransomware holds your PC _____ and _____ money. It locks up your computer _____ to destroy data …
5. _____ secretly _____ private information about the user activity …
6. Worms can _____ _____ and infect multiple computers on the network _____ _____ _____.

Task 8. Guess what malware is described in each paragraph:

1. _____ is malicious software designed to enter a computer device, gather data about a person or organization and forward it to a third-party without a user's consent.
2. _____ are harmful programs designed to infect vulnerable systems. Once a user installs and runs the infected file, the malicious code is activated and spreads itself to other programs installed on the computer.
3. _____ is a form of financially supported malware that usually presents itself as unwanted advertisements.

4. _____ is a type of spyware used to monitor and record each keystroke on a specific keyboard. The information is gathered and sent to the attacker. This malware is most often used for stealing passwords.
5. _____ is a standalone malicious computer program that replicates itself to infect other computers. It is able to spread across the network directly without attaching itself to an existing program.
6. _____ is any malware that misleads users of its true intent by pretending to be a useful program.
7. _____ is a type of malware that threatens to publish the victim's data or perpetually block access to the device unless a payment is made.

Task 9. Read the article and choose the correct answers:

1 What is the main purpose of the article?

A to explain how to install firewalls
B to identify common firewall weaknesses
C to clarify information about firewalls
D to compare and contrast different firewalls

2 Which of the following is NOT one of the steps of packet filtering?

A The firewall filters the incoming packets.
B The network administrator decides to reject or permit the communication.
C Data is broken into packets.
D The firewall determines whether to accept the information.

3 Why would a user create an exception?

A to allow communication from a particular program
B to lower the security settings of the whole firewall
C to block a certain IP address from communicating with the network
D to restore the firewalls default settings

The Firewall

There are several ways that firewalls work. Most use a combination of methods. One common method is packet filtering. Incoming data is broken down into small chunks, or packets. The firewall then inspects each packet using a set of filters. Based on settings determined by the user, the firewall decides whether to deny or permit access.

Filters can be based on a number of different things. For example, filters can block all access to and from specific domain names. If a network administrator notices a particular IP address is generating a lot of traffic to or from the network, he or she could create a filter to block that IP address. Filters can also look for certain words or phrases.

For most users, the default settings of the program will provide enough protection. A user can always create an exception to allow an unauthorized program. This gives the program permission to communicate through the firewall, even if the program is normally blocked. The program accesses the Internet without lowering the settings for the whole firewall.

Task 10. Match the words or phrases (1-6) with the definitions (A-F):

1. firewall	a) not allowed
2. deny	b) a division of data
3. packet	c) to allow someone to do something
4. unauthorized	d) not to allow someone to do something
5. default	e) a program used to protect private networks
6. permit	f) a present value of a particular setting

Task 11. Fill in the blanks with the following words:

installed / permission / traffic / firewall / incoming /
biometric scanning / access / default

1. _____ protects the system from public access.
2. Usually the firewall's _____ settings provide enough protection.
3. If a website has a lot of _____, it means it has a lot of visitors.
4. A firewall scans _____ data to decide whether or not to receive it.
5. Some firewalls block all _____ to a certain website.

6. The network administrator can give users _____ to access certain sites.
7. They have _____ the latest anti-virus software.
8. _____ is one way to make sure that only authorized people access the network.

Task 12. Read the text and fill in the gaps with the missing words:

Antivirus Software

suspicious / hands-off / executable / combination / intent / traced / action / robust / apart / target

Antivirus software is designed to detect, prevent and take (1) _____ to disarm or remove malicious software from your computer such as viruses, worms and Trojan horses. It may also prevent or remove unwanted spyware and adware in addition to other types of malicious programs. The first versions of antivirus software can be (2) _____ as far back as the 1980s.

While you may think that your computer is safe as long as you don't visit (3) _____ websites, hackers have much more nuanced ways of getting their viruses on your computers, which is why you need a (4) _____ antivirus to stay one step ahead of them. Some antivirus software will ask for your permission before "cleaning" a file to remove malicious code. If you prefer a (5) _____ approach, you can adjust the settings so the software automatically removes malicious files.

Every virus contains a *signature*, which is like its fingerprint. It's the distinguishing feature that sets it (6) _____ from other programs running on your computer, and it also makes the virus recognizable, and therefore a potential (7) _____ for antivirus software. Documents, programs and applications are generally scanned for viruses when they are being used. Once an (8) _____ file is downloaded, it is instantly scanned to check if it is infected with malware.

As opposed to signature-based scanning, which matches signatures found in files with that of a database of known malware, heuristic scanning uses rules and/or algorithms to look for commands which may indicate malicious (9) _____. This causes the antivirus programming to recognize new malware without having the exact match in the database. Most antivirus programs use both signature and heuristic-based methods in (10) _____, in order to catch any malware that may try to evade detection.

Task 13. Find English equivalents for the following words and phrases in the text:

1) принимать меры
2) нежелательные шпионские программы
3) подозрительные сайты
4) на шаг впереди
5) подход
6) отпечаток пальцев
7) отличительная черта
8) заражённый

Task 14. Translate from Russian into English:

1. Это программа, автоматически запускающая на экране рекламу.
2. Важное правило защиты – не переходить по сомнительным ссылкам и не запускать подозрительные программы.
3. Это бесплатная программа, содержащая в себе вирус.
4. Есть ряд мер, которые блокируют установку вирусов, червей, шпионских программ и другого вредоносного программного обеспечения.
5. Служба безопасности зафиксировала попытку получить несанкционированный доступ к системе.
6. Пользователи могут не подозревать о наличии вируса в своих компьютерах.
7. Он хочет установить антивирусную программу.
8. Настройки по умолчанию не гарантируют достаточной защиты.
9. Пиратство – это нарушение авторских прав.
10. Фишинг – это незаконная попытка получения паролей и данных кредитных карт.

Task 15. Last week, the company you work for found a virus in the network. You have solved the problem. Write an email to the IT manager:

1. say what the problem was
2. say what you think caused it
3. say what you did to solve it
4. suggest what the company should do to stop this happening again
5. recommend new security software

UNIT 10: PROFESSIONS IN IT

Task 1. Give definitions to the following terms and phrases and translate them into Russian:

critical-thinking	data science
problem-solving skills	computer engineering
a full-time job	software engineering
a part-time job	software life cycle
to master new skills	Human Resources Department
to gain knowledge	on-the-job training

Task 2. Read the text "Career options for software engineers" and answer the questions:

1) How does the software life cycle affect jobs in the software industry?
2) What are the advantages of joining IEEE and ACM?

Career options for software engineers

Software engineering is a rapidly growing industry in today's high-tech economy. It is going to witness an exponential rise in the coming years thanks to the relevance and need for data science, software development and cybersecurity. The software life cycle is quickening, which means that companies must develop technology faster and faster.

So what are your options? Many engineers start in technical support. This is a good place to become familiar with different technologies. Some engineers also learn about products as testers and analysts. These jobs promote critical thinking and problem-solving skills. Mastering these skills is essential if one wants to succeed in the field of software engineering.

Nowadays, almost every industry has a growing need for software development. Some companies hire full-time developers, while others take on freelancers. There are many types of software that a software engineer can develop, such as operating systems, computer games, business applications and network control systems.

If you enjoy concepts and theories, check out the educational field. Universities

need well-trained educators, especially those with skills to be researchers. Even if education is not your long-term goal, it is a great opportunity for professional development. More experience and education will help you advance in your career.

Whatever your goals, consider joining the IEEE (*the Institute of Electrical and Electronics Engineers*) and ACM (*the Association for Computing Machinery*). Membership in these professional organizations come with opportunities for networking and further career development.

Task 3. Match the words and phrases (1-7) with the definitions (a-g).

1. tester
2. freelancer
3. researcher
4. membership
5. technical support
6. professional development
7. ACM

a) someone who is not employed by any organization but does particular pieces of work for different organizations
b) the state of belonging to an organization
c) the process of gaining knowledge that furthers one's career
d) a repair and advice service that some companies provide for their customers
e) a professional organization that supports the study of computers
f) a professional who studies or analyzes a subject
g) a professional who uses products to determine how well they function

Task 4. Find the following expressions in the text and explain what they mean:

1. a long-term goal
2. become familiar with something
3. an exponential rise
4. opportunities for networking
5. high-tech economy

Task 5. Read the job advertisement below and fill in the gaps with the correct prepositions:

at (2) / of (2) / with (2) / to / on / for / in

Computer Engineer Position Available

Dynxis Corp. is seeking talented computer engineers. Candidates must have (1) __ least five years of experience. They should have mastery (2) ___ both hardware design and programming. We will only consider an applicant (3) _____ a bachelor's degree (4) ___ a relevant field. Additionally, he or she must pay close attention (5) ___ current technology and trends.

We are looking (6) __ someone who is thorough and detail-oriented. Candidates should be able to focus (7) __ multiple tasks simultaneously. Our systems are extremely complex. This means that even minor errors can be critical.

At Dynxis Corp., we value critical thinking. We appreciate employees who can find logical solutions. However, we also seek curious individuals (8) ____ innovative ideas. We encourage employees to think creatively. We want people with a balance (9) ___ both practical and creative skills. We have high standards (10) __ Dynxis Corp. If you are dedicated and efficient, we encourage you to apply.

Task 6. Answer the following questions:

1. What level of education is required for the position?
2. What experience is required for the position?
3. What personal qualities should a successful candidate have?
4. Why is it important for a candidate to be able to focus on multiple tasks simultaneously?

Task 7. Match the words (1-6) with the definitions (a - f).

1. focus on	a) able to pay attention to small, specific parts of something
2. mastery	b) new, creative and advanced
3. efficient	c) able to do something competently and quickly
4. dedicated	d) advanced knowledge or skills in a particular area
5. innovative	e) wholly committed to a certain task or goal
6. detail-oriented	f) to give full attention to something

Task 8. Read the following pairs of sentences and choose the word or phrase which fits each gap.

1. *critical thinking/ close attention*
A. The supervisor pays _____ to his team's work.
B. This computer engineering program promotes problem-solving and _____.

2. *thorough/ logical*
A. The technician found a _____ solution to the problem.
B. The employee was _____ and checked each compartment.

3. *dedicated/ curious*
A. She is completely ____ to her work and spends most of her time in the laboratory.
B. The employee was ____ about the new software, so he researched it further.

Task 9. Read the passages describing different jobs in IT and fill in the gaps with the suitable words and expressions.

Hardware Engineer

draw on / meets / involves / needs/ installation

Hardware engineers (1)_____ computer engineering to develop, design and test various physical components related to computer systems. Their job also (2)_____ designing and creating prototypes as well as overseeing the manufacturing and (3)_____ process to ensure the hardware (4) _____ the existing standards and functions properly.
Moreover, people working in this field are responsible for continuing to improve the technology to meet the changing (5)_____ of computer users.

System Administrator

ongoing / troubleshoot / responsible / respond / through

A system administrator is (1) _____ for maintaining an organization's computer systems and providing a reliable work environment. They perform (2) _____ monitoring of all servers to make sure the systems function properly, install

and upgrade computer components and software, (3)_____technical issues. A system administrator also has to ensure security (4) _____ access control, backups and firewalls. They have to monitor the system daily and (5) _____ immediately to any security and usability concerns.

Database Administrator

implementing / be recovered / vary / wide range / take care

The job of a database administrator involves creating and managing computerized databases within a (1) _____ of public and private sector organizations. They design and (2) _____ of computer database systems so that the right people can get the information they need at the right time. Responsibilities can (3) _____ according to a company's needs but typically include: archiving data, (4) ____ security measures, troubleshooting, keeping the database up to date, ensuring that the database is adequately backed up and can (5) _____ in the event of data loss.

Web Developer

in-depth / user-friendly / maintain / be familiar / functionality

Web Developers are information technology (IT) professionals who design, develop, and (1) _____ websites. Web Developers should have (2) _____ knowledge of HTML, CSS, and JavaScript to create websites using templates or from scratch. It is also important for Web Developers to (3) _____ with Search Engine Optimization processes. They are responsible for maintaining a (4) _____, stable website that offers the necessary (5) _____ for their clients' needs. Using their strong technical skills, Web Developers work with Web Designers to determine the look of a website.

Task 10. Do some research on the Internet and write a similar job description for another profession in the field of IT.

Task 11. Translate the following sentences from Russian into English:

1. Программист – это специалист, который создаёт код для различных программ.

2. Специалисты, работающие в сфере информационных технологий, очень востребованы сегодня.
3. Каждый год в сфере IT появляются новые профессии.
4. Системный администратор следит за тем, чтобы вся компьютерная техника и программное обеспечение в офисе работали без перебоев.
5. Специалист по информационной безопасности должен обеспечить защиту системы от несанкционированного доступа.
6. В обязанности тестировщика входит поиск вероятных ошибок и сбоев в функционировании объекта тестирования (например, программы).
7. Тестировщик ПО моделирует различные ситуации, которые могут возникать в процессе использования программы, чтобы разработчики смогли исправить обнаруженные ошибки.
8. В обязанности администратора баз данных входит управление учётными записями пользователей и защита системы от несанкционированного доступа.
9. Разработчики программного обеспечения очень востребованы сегодня, так как сфера информационных технологий развивается быстрыми темпами.
10. Наша компания ищет специалиста, который имеет опыт работы с облачными инфраструктурами.

UNIT 11: THE FUTURE OF IT

Task 1. Give definitions to the following terms and phrases and translate them into Russian.

artificial intelligence
artificial neural network
biometrics
machine learning
nanobots
nanocomputers
nanomaterials
nanomedicine
nanotechnology
nanotransistors
pervasive computing
robotics
smart home appliances
ubiquitous devices

Task 2. Read the text "An artificial neural network" and answer the questions:

1. What is an artificial neural network?
2. What problems do professionals come across when working with artificial neural networks?

An artificial neural network

If you have spent any time reading about artificial intelligence, you should have heard about artificial neural networks. Artificial neural networks, usually simply called neural networks, are computing systems inspired by the biological neural networks that make up animal brains. Artificial neural networks are one of the main tools used in machine learning.

As the "neural" part of their name suggests, they are brain-inspired systems which are intended to replicate the way that humans learn. Artificial neural network is based on a collection of connected units, or nodes, called artificial neurons, which simulate the neurons in a biological brain. Each connection, like the synapses in a biological brain, can transmit a signal to other neurons. An artificial neuron that receives a signal then processes it and can signal neurons connected to it. Such neurons are usually relatively simple, but being connected in a large network, they can perform quite complex tasks.

Neural network can accomplish many tasks: from face recognition and making cars drive autonomously on the roads, to generating shockingly realistic CGI (Computer-generated image) faces, to machine translation, to fraud detection, to reading our minds, to recognizing when a cat is in the garden and turning on the sprinklers; neural nets are behind many of the biggest advances in A.I. Broadly speaking, they are designed for spotting patterns in data. Specific tasks could include classification (classifying data sets into predefined classes), clustering (classifying data into different undefined categories), and prediction (using past events to guess future ones, like the stock market or movie box office).

Neural networks are excellent tools for finding patterns which are too complex or numerous for a human programmer to extract and teach the machine to recognize. Neural networks are not programmed in the usual meaning of the word, they are trained. Training or learning is one of the main advantages of neural networks over traditional algorithms.

In the same way that we learn from experience in our lives, neural networks require data to learn. In most cases, the more data can be thrown at a neural network,

the more accurate it will become. Think of it like any task you do over and over. Over time, you gradually get more efficient and make fewer mistakes.

On a technical level, one of the main challenges is the amount of time it takes to train networks, which can require a considerable amount of computing power for more complex tasks. The biggest issue, however, is that neural networks are "black boxes," in which the user feeds in data and receives answers. They can fine-tune the answers, but they don't have access to the exact decision-making process.

This is the problem a number of researchers are working on today, but it will only become more important as artificial neural networks play a bigger and bigger role in our lives.

Task 3. Read the sentences below and fill in the gaps with the suitable words using the information given in the text:

artificial neurons / data / machine learning / patterns / amount of time

1. Artificial neural networks are one of the main tools used in _____.
2. Broadly speaking neural networks are designed for spotting_____ in data.
3. Artificial neural network is based on_____.
4. In the same way that we learn from experience in our lives, neural networks require_____ to learn.
5. On a technical level, one of the biggest challenges is the_____ it takes to train networks.

Task 4. Think about the tasks neural networks can accomplish and the areas where they can be applied.

Task 5. Read the text and translate it into Russian.

How does artificial neural network work?

While neural networks (also called "perceptrons") have been around since the 1940s, it is only in the last several decades where they have become a major part of artificial intelligence. This is due to the arrival of a technique called "backpropagation". Neural networks consist of input and output layers, as well as (in most cases) a hidden layer consisting of units that transform the input into something that the output layer can use. Backpropagation allows networks to adjust their hidden layers of neurons in situations where the outcome does not match what the creator is

hoping for — like a network designed to recognize dogs, which mistakenly identifies a cat, for example.

Another important advance has been the arrival of deep learning neural networks, in which different layers of a multilayer network extract different features until it can recognize what it is looking for. For a basic idea of how a deep learning neural network learns, imagine a factory line. After the raw materials (the data set) are input, then they are passed down the conveyer belt, with each subsequent stop or layer extracting a different set of high-level features. If the network is intended to recognize an object, the first layer might analyze the brightness of its pixels.

The next layer could then identify any edges in the image, based on lines of similar pixels. After this, another layer may recognize textures and shapes, and so on. By the time the fourth or fifth layer is reached, the deep learning net will have created complex feature detectors. It can figure out that certain image elements (such as a pair of eyes, a nose, and a mouth) are commonly found together.

Once this is done, the researchers who have trained the network can give labels to the output, and then use backpropagation to correct any mistakes which have been made. After a while, the network can carry out its own classification tasks without human help.

When researchers or computer scientists set out to train a neural network, they typically divide their data into three sets. First is a training set, which helps the network establish the various weights between its nodes. After this, they fine-tune it using a validation data set. Finally, they use a test set to see if it can successfully turn the input into the desired output.

Task 6. Find the following expressions in the text and explain what they mean:

1. neural network
2. backpropagation
3. perceptrons
4. artificial intelligence
5. computer scientists
6. to train the network
7. complex feature detectors

Task 7. Read the sentences below and fill in the gaps with the suitable words:

deep learning / mistakes / backpropagation / network / classification

1. A technique called _____ allows networks to adjust their hidden layers of neurons in situations where the outcome does not match what the creator is hoping for.
2. Different layers of a____ neural network extract different features until it can recognize what it is looking for.
3. The researchers who have trained the network can give labels to the output, and then use backpropagation to correct any _____ which have been made.
4. The network can carry out its own _____ tasks without human help.
5. Computer scientists use a test set to see if a neural ____ can successfully turn the input into the desired output.

Task 8. Read the text "Internet of things (IoT)" and answer the questions:

1. What is the internet of things?
2. What are the benefits of using the internet of things?

Internet of things (IoT)

The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

A thing in the internet of things can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or artificial object that can be assigned with an Internet Protocol (IP) address and is able to transfer data over a network.

How IoT works

An IoT ecosystem consists of web-enabled smart devices that use embedded systems, such as processors, sensors and communication hardware, to collect, send and operate on the data they acquire from different sources. IoT devices share the sensor data they collect by connecting to an IoT gateway or other edge device where data is either sent to the cloud to be analyzed or analyzed locally. Sometimes, these devices communicate with other related devices and act on the information they get

from one another. The devices do most of the work without human intervention, although people can interact with the devices — for instance, to set them up, give them instructions or access the data.

IoT can also use artificial intelligence (AI) and machine learning to make data collecting processes easier and more dynamic.

Why IoT is important

The internet of things helps people to gain complete control over their lives. In addition to offering smart devices to automate homes, IoT is essential to business. IoT provides businesses with a real-time look into how their systems really work, delivering insights into everything from the performance of machines to supply chain and logistics operations.

IoT enables companies to automate processes and reduce labor costs. It also cuts down on waste and improves service delivery, making it less expensive to manufacture and deliver goods, as well as offering transparency into customer transactions.

Pros and cons of IoT

Some of the advantages of IoT include the following:

- ability to access information from anywhere at any time on any device.
- improved communication between connected electronic devices.
- transferring data packets over a connected network saving time and money.
- automating tasks helping to improve the quality of a business's services and reducing the need for human intervention.

Some disadvantages of IoT include the following:

- As the number of connected devices increases and more information is shared between devices, the potential that a hacker could steal confidential information also increases.
- Enterprises may eventually have to deal with massive numbers — maybe even millions — of IoT devices and collecting and managing the data from all those devices will be challenging.
- If there is a bug in the system, it is likely that every connected device will become corrupted.

- Since there is no international standard of compatibility for IoT, it's difficult for devices from different manufacturers to communicate with each other.

Task 9. Write a summary of the text.

Task 10. Read the sentences below and fill in the gaps with the suitable words using the information from the text:

transfer / biochip /computing / machine / smart

1. The internet of things, or IoT, is a system of interrelated _____ devices, mechanical and digital machines.
2. IoT is a system of devices that are provided with the ability to _____ data over a network without requiring human-to-human or human-to-computer interaction.
3. A thing in the internet of things can be a person with a heart monitor implant, a farm animal with a _____ transponder.
4. An IoT ecosystem consists of web-enabled _____ devices that use embedded systems, such as processors, sensors and communication hardware.
5. IoT can also use artificial intelligence (AI) and _____ learning to make data collecting processes easier and more dynamic.

Task 11. Translate the following sentences into English.

1. Искусственная нейронная сеть состоит из совокупности связанных узлов, называемых искусственными нейронами.
2. Нейронные сети не программируются в привычном понимании этого слова, они обучаются.
3. Чем больше данных обработает нейронная сеть, тем точнее будет её последующая работа.
4. Нейронная сеть — это «черный ящик», в который пользователь вводит данные и получает ответы. Вы можете повышать точность ответов, но вы не знаете, как именно эти ответы получены.
5. Нейронные сети — отличные инструменты для поиска закономерностей, которые слишком сложны или многочисленны, чтобы программист мог научить машину их распознавать.
6. Нейронные сети стоят за многими из самых больших достижений в области искусственного интеллекта.

7. Интернет вещей помогает людям лучше контролировать свою жизнь и повышает эффективность работы многих компаний.
8. Интернет вещей также может использовать искусственный интеллект и машинное обучение, чтобы сделать процесс сбора данных проще и динамичнее.
9. Чем больше информации передается между устройствами, тем выше вероятность того, что хакер может украсть конфиденциальную информацию.
10. Автоматизация задач помогает повысить качество бизнес-услуг и снижает необходимость вмешательства человека.
11. Интернет вещей позволяет компаниям в режиме реального времени видеть, как на самом деле работают их системы.

SUPPLEMENTARY READING

Text 1.

Read the text and mark the following statements as True or False:

1. Mainframe computers are thought to be outdated and obsolete because of the recent fast developments in distributed systems, meaning networks of small and cheaper machines.
2. All companies that use mainframes choose them because they are reliable, secure and easy to maintain.
3. Mainframes ruled supreme in the corporate data centers until the beginning of the 21st century.
4. IBM runs special programs helping schools and universities to train mainframe administrators.

Back in Fashion

Geeks may roll their eyes at the news that Namibia is only now getting its first mainframe — a technology that most consider obsolete. Yet the First National Bank of Namibia, which bought the computer, is at the leading edge of a trend. Comeback is too strong a word, but mainframes no longer look that outdated.

Until the 1980s mainframes, so called because the processing unit was originally housed in a huge metal frame, ruled supreme in corporate data centers. Since then, these big bundles of software and hardware have been dethroned by "distributed systems", meaning networks of smaller and cheaper machines. But many large companies still run crucial applications on the "big iron": there are still about 10,000 in use worldwide. Withdraw money or buy insurance, and in most cases mainframes are handling the transaction.

Some companies like mainframes because they are reliable, secure and easy to maintain. But others have no choice. Banks, for instance, use decades-old applications to manage customer accounts. Moving these programs to other computers would be expensive and sometimes impossible. Most firms that can move off the mainframe have already done so.

High "switching costs" explain in large part why mainframes are still a good business for IBM. It is the only big firm left selling them, at prices that start at $100,000 but often reach the millions. Sales of mainframes are said to have brought in about $3.5 billion a year, on average, in the past decade. Although this is only about 3.5% of the firm's overall revenue, each dollar spent on hardware pulls in at least as much from sales of software and maintenance contracts.

To preserve its mainframe business, IBM has regularly modernized its line-up of machines, lowering prices and improving performance. It has also given cash and computers to hundreds of universities and schools to get them to train replacements for retiring mainframe administrators.

In addition, IBM is trying to get customers to use mainframes for more functions. For some years it has offered specialized add-on processors at considerably lower prices, to run a greater variety of programs, mostly based on Linux, an open-source operating system. And last year IBM started bundling mainframes with applications at a discount. IBM is also trying to attract new customers, particularly in fast-growing emerging markets. Without mainframes, India's Housing Development Finance Corporation and the Bank of China in Hong Kong would have a hard time dealing with their explosive growth.

The computer industry seems to be moving IBM's way. The mainframe may well find a new home in corporate computing clouds, the pools of data processing capacity many firms are building. Many companies are increasingly interested in buying simpler, more integrated computer systems, even if this means a higher price. Reacting to this, IBM's rivals are making bets on mainframe-like products. On January 13th 2010 HP and Microsoft announced a pact to come up with tight packages of hardware and software. Brad Day of Forrester Research, another market-research

group, puts it thus: “We are on the way back to the future”.

Text 2

Task 1. Read the article below about Moore’s Law. Choose from the list A–F the sentence, which best summarizes each part 1–5 of the article. There is one extra sentence, which you do not need to use.

A. No matter what obstacle arises, scientific research needs will advantage further chips manufacture.

B. Increasing manufacturing costs could halt the sustained pace of microprocessor growth.

C. We can’t disregard the fact that one day technical difficulties could hamper the production of ever-more complex chips.

D. The competition between chip manufacturers as well as consumers pursuit of innovations keep Moore’s predictions in force.

E. A strong tendency of contemporary computer users to change powerful desktops and laptops for internet-centric devices with reduced performance disputes whether Moore’s Law is still relevant.

F. Moore predicted that the number of transistors (hence the processing power) that could be squeezed onto a silicon chip of a given size would double every 18 months.

How Moore’s Law Works

1. If you were to chart the evolution of the computer in terms of processing power, you would see that progress has been exponential. The man who first made this famous observation is Gordon Moore, a co-founder of the microprocessor company Intel. In general, most people interpret Moore’s Law to mean the number of transistors on a 1-inch (2.5 centimeter) diameter of silicon doubles every 18 months. The discovery of semiconductors, the invention of transistors and the creation of the integrated circuit are what made Moore’s Law possible. Cramming more components on an integrated circuit doesn’t just mean devices are becoming more powerful — it also means they’re getting smaller.

2. Why have Moore’s observations and predictions held true over so many decades? Much of the reason is psychological and driven by the market. The rapid development of electronics has created a sense of expectation among consumers. Every year, faster and more advanced electronics hit the market. From the consumer’s point of view, there’s no reason not to expect something better next year.

Companies that make integrated circuits are competing against each other to meet the consumers' expectations and pour a lot of money into research and development (R&D). These R&D divisions work to develop new techniques to create smaller components and arrange them in such a way that maximizes their performance. Another factor is the simple desire to overcome a challenge.

3. Even Gordon Moore has questioned how long the cycle of innovation and production can keep up the pace of the last four decades. Will there ever be an end to Moore's Law? One of these days we could hit a technical barrier that prevents engineers from finding a way to make smaller components, or we could bump up against the fundamental laws of physics — like the speed of light, for instance. The problem with predicting a specific date when one or more of these barriers will stop progress is that we have to base it on what we know today. But every day engineers are learning new ways to design, build and produce circuits. What we know tomorrow may make the things that seem impossible today completely achievable.

4. But even if we don't encounter technical obstacles, economics could come into the equation. If it's not economically feasible to produce circuits with smaller transistors there may be no reason to pursue further development. The era of the personal computer has been dominated by a sense that the consumer needs the latest and greatest machine on the market. But today, some people are questioning that philosophy. Part of that is due to changes in consumer behavior — many computer owners use their computers for simple tasks like browsing the Web or sending e-mail. These applications don't put a heavy demand on the computer's hardware.

Another reason powerful PCs aren't as necessary is the rise in popularity of cloud computing. Cloud computing shifts the burden of processing and storing data to a network of computers. Users can access applications and information using the Internet, so they don't necessarily need a powerful machine of their own to take advantage of cloud computing. As a result, devices like smartphones and tablets are becoming more popular. If consumers continue to purchase devices like smartphones and tablets, microprocessor manufacturers will have less of an incentive to meet the expectations of Moore's Law. If there's no market for ultra-powerful processors, then we've hit the economic barrier that could bring an end to the cycle.

5. That said, some facilities may still push the limits of integrated circuit production. While the average consumer may not see the value in a powerful PC, research facilities still rely on the fastest processors in production. More powerful microprocessors can aid in everything from weather prediction to cosmological studies. One lesson we can draw from Moore's Law and the semiconductor industry is that pure research can yield beneficial results for society. The engineers at Bell

Laboratories had no guarantee that their experimental work with the earliest transistor models would yield positive results. But their research and hard work spawned an industry that changed the way we live.

Task 2. Find English equivalents for the following words and word combinations in the text:

1. рост в геометрической прогрессии
2. отвечать ожиданиям потребителя
3. преодолевать препятствие
4. с точки зрения потребителя
5. достижимый
6. встретить препятствие
7. подвергать сомнению
8. положить конец (чему-либо)
9. расширять границы возможностей
10. давать положительные результаты

<u>Text 3.</u>

Task 1. Read the text and translate it into Russian:

Computer technology grows rapidly. The capacity of data storage is no exception. Hard drives and storage devices improve all the time.

Early computers relied on magnetic tape. Developers soon replaced these with more efficient floppy disks. However, these still had limited space. For a while, Zip drives were a larger-capacity solution.

Then CDs came along. These lightweight, inexpensive devices are easy to store and discard. DVDs have similar benefits, and hold much more data. However, erasing and reprogramming these devices is often unreliable.

Today, we have compact flash memory. Tiny flash drives hold more information than earlier devices, including DVDs. Unlike most DVDs and CDs, flash drives are easily erasable.

Task 2. Choose the correct answer:

1. What is the main idea of the article?

A the rising costs of data storage devices
B a history of data storage devices
C materials used to make data storage devices

D addressing problems with data storage devices

2. Which of the following is NOT a benefit of CDs?

A They are easy to store.
B They are lightweight.
C They can be erased and reprogrammed.
D They have a lower capacity than DVDs.

3. According to the article, what makes Zip drives better than floppy disks?

A a smaller size
B more affordable cost
C a higher capacity
D the ability to be erased

Text 4.

Read the text on cloud computing and make questions to the answers below:

1. A third-party cloud service provider.
2. On the company's on-site data center.
3. Buying hardware and software and setting up and running on-site data centers.
4. Because it could be used by rivals.

Cloud computing is the delivery of on-demand computing services typically over the Internet and on a pay-as-you-go basis, without direct active management by the user. Rather than owning their own computing infrastructure or data centers, companies can rent access to anything from applications to storage from a cloud service provider.

Not all clouds are the same and not one type of cloud computing is right for everyone. Several different models, types, and services have evolved to help offer the right solution for your needs.

Public clouds are owned and operated by third-party cloud service providers, which deliver their computing resources, like servers and storage, over the Internet. With a public cloud, all hardware, software, and other supporting infrastructure is owned and managed by the cloud provider. You access these services and manage your account using a web browser.

A private cloud refers to cloud computing resources used exclusively by a single business or organization. A private cloud can be physically located on the company's on-site data center. Some companies also pay third-party service providers to host their private cloud. A private cloud is one in which the services and infrastructure are maintained on a private network.

Among the top benefits of cloud computing you can name cost. Cloud computing eliminates the capital expense of buying hardware and software and setting up and running on-site data centers - the racks of servers, the round-the-clock electricity for power and cooling, and the IT experts for managing the infrastructure.

Another argument in favor of this technology is productivity. On-site data centers typically require a lot of hardware setup, software patching, and other time-consuming IT management chores. Cloud computing removes the need for many of these tasks, so IT teams can spend time on achieving more important business goals.

Opponents of cloud computing argue that there are some downsides to the technology as well. It is not necessarily cheaper than other forms of computing, just as renting is not always cheaper than buying in the long term. If an application has a regular and predictable requirement for computing services it may be more economical to provide that service in-house. Additionally, some companies may be reluctant to host sensitive data in a service that is also used by rivals.

Text 5.

Read the email below and choose the correct answers:

1. What is the main purpose of the email?

A to report a nationwide rise in Internet crime
B to help clients keep their information secure
C to announce a new website

2. How can users be sure they are on the official Safeguard site?

A by entering a PIN
B by sending an email to the site
C by verifying the URL

3. How did hackers infect customers' computers with malware?

A They used a keylogger.
B They attached spyware to a download.
C They used backdoor hacks into customers' computers.

Dear Valued Customer,

Perpetrators of online fraud and identity theft have recently targeted customers of Safeguard Insurance Co.

Several members of the Safeguard community have reported receiving phishing emails. Safeguard Insurance will never ask for your personal information or credit card number by email. If you receive one of these emails, please report it immediately. Pretexting is a serious crime, and we are working with federal police to stop it.

Furthermore, hackers recently used a backdoor to hack into the Safeguard website. They used a keylogger to obtain important passwords. They used information gathered with these passwords to create a pharming website. This website looks almost identical to the Safeguard site. When you use the Safeguard website, please verify that you are on the official Safeguard site. You can do this by checking the URL. This will help us maintain information security.

Lastly, some users of the Safeguard website have reported becoming infected with malware, most commonly spyware. This occurred after downloading the 'Insurance FAQ' sheet from our website. We have removed the downloadable file to prevent the spread of malware.

Thank you for your careful attention to these matters. We are confident that we will soon be able to offer you the peace of mind that we know you value so highly.

<u>Text 6.</u>

Task 1. Read the text below and translate it into Russian.

MIT researchers are working to create neural networks that are no longer black boxes.

Whether you like it or don't entirely trust it, there is no denying that brain-inspired deep learning neural networks have proven to be capable of making

significant advances in a number of AI-related fields over the past decade.

"Deep learning has led to some big advances in computer vision, natural language processing, and other areas," Tommi Jaakkola said, a professor of electrical engineering and computer science in Massachusetts Institute of Technology. "It's tremendously flexible in terms of learning input/output mappings, but the flexibility and power come at a cost. It's very difficult to work out why it is performing a certain prediction in a particular context."

This black-boxed lack of transparency would be one thing if deep learning systems were still confined to being lab experiments, but they are not. Today, AI systems are increasingly rolling out into the real world — and that means they need to be available for inspection by humans.

"This becomes a real issue in any situation where there are consequences to making a prediction, or actions that are taken on the basis of that prediction," Jaakkola said.

Fortunately, a new project from MIT's Computer Science and Artificial Intelligence Laboratory (CSAIL) has appeared. What researchers there have come up with is preliminary work showing that it is possible to train neural networks in a way that they do not just offer predictions and classifications, but also rationalize their decision.

For the study, the researchers examined neural nets that were trained on textual data. This network was divided into two modules: one which extracted segments of text and scored them on their length and consistency, the second which performed the task of predicting or classifying.

A data set the researchers tested their system on was a group of reviews from a website in which users rated fruit juice. The data the researchers used included both a text review and also a corresponding star review, ranked out of five. With these inputs and outputs, the researchers were able to fine-tune a system which "thought" along the same lines as human reviewers — thereby making its decisions more understandable.

Ultimately, the system's agreement with human annotations was 96 percent when predicting ratings of juice aroma, and 80 percent when predicting taste.

The research is still in its early stages, but it is an intriguing advance in developing AI systems which make sense to human creators and can justify decisions accordingly.

"The question of justifying predictions will be a prevalent issue across complex AI systems," Jaakkola said. "They need to be able to communicate with people. Whether the solution is this particular architecture or not remains to be seen. Right

now, we are in the process of revising this work and making it more sophisticated. But it absolutely opens up an area of research that is very important."

Task 2. Make up 5 questions to the text and ask your partner.

Task 3. Write a summary of the text above

<u>Text 7.</u>

Task 1. Read the text "Future technologies and 5G network" and translate it into Russian.

Future technologies and 5G network

Today's mobile users want faster data speed and more reliable service. The next generation of wireless networks — 5G — promises this reliable service. With 5G, users should be able to download a high-definition film in under a second (a task that could take 10 minutes on 4G). And wireless engineers say these networks will boost the development of other new technologies, too, such as autonomous vehicles, virtual reality and the Internet of Things.

Telecommunication companies hope to present the first commercial 5G networks. 5G is still under development, and companies and industry groups are working together to figure out exactly what it will be. But they all agree on one matter: as the number of mobile users and their demand for data rises, 5G must handle far more traffic at much higher speed than the base stations that make up cellular networks can cope with today. To achieve this, engineers are designing a suite of brand-new technologies. Together, these technologies will transfer data with less than a millisecond of delay (compared to about 70 ms on 4G networks) and bring peak download speed of 20 gigabits per second (compared to 1 Gb/s on 4G) to users.

At the moment, it's not yet clear which technologies will do the most for 5G in the long run, but a few early favorites have appeared. The front-runners include millimeter waves, small cells, full duplex and beamforming. To understand how 5G will differ from 4G networks, it's helpful to look through these technologies and consider what these technologies will mean for users.

Millimeter Waves

Today's wireless networks have run into a problem: more people and devices are consuming more data than ever before, but it remains crammed on the same bands of the radio-frequency spectrum that mobile providers have always used. That means less bandwidth for everyone, causing slower service and more dropped connections. One way to deal with that problem is to simply transmit signals on a new band of the spectrum, one that's never been used for mobile service before. That is why providers are experimenting with broadcasting on millimeter waves, which use higher frequencies than the radio waves that have been used for mobile phones.

Millimeter waves broadcast at frequencies between 30 and 300 gigahertz, compared to the bands below 6 GHz that were used for mobile devices in the past. They are called millimeter waves because they vary in length from 1 to 10 mm, compared to the radio waves that serve today's smartphones, which measure tens of centimeters in length. Until now, only operators of satellites and radar systems used millimeter waves for real-world applications. Now, some cellular providers have begun to use them to send data between stationary points, such as two base stations. But using millimeter waves to connect mobile users with a nearby base station is an entirely new approach. There is one major drawback to millimeter waves, though — they cannot easily travel through buildings or obstacles and they can be absorbed by vegetation and rain. That is why 5G networks will likely augment traditional cellular towers with another new technology, called small cells.

Small Cells

Small cells are portable miniature base stations that require minimal power to operate and can be placed every 250 meters or so throughout cities. To prevent signals from being dropped, carriers could install thousands of these stations in a city to form a dense network that acts like a relay team, receiving signals from other base stations and sending data to users at any location.

This radically different network structure should provide more targeted and efficient use of spectrum. There is a problem, though — the sheer number of small cells required to build a 5G network may make it difficult to set up in rural areas.

Beamforming

Beamforming is a traffic-signaling system for cellular base stations that

identifies the most efficient data-delivery route to a particular user, and it reduces interference for nearby users in the process.

For millimeter waves, beamforming is primarily used to address a different set of problems: cellular signals are easily blocked by objects and tend to weaken over long distances. In this case, beamforming can help by focusing a signal in a concentrated beam that points only in the direction of a user, rather than broadcasting in many directions at once.

Full Duplex

Today's base stations and cellphones rely on transceivers that must take turns if transmitting and receiving information over the same frequency or operate on different frequencies if a user wishes to transmit and receive information at the same time.

With 5G, a transceiver will be able to transmit and receive data at the same time, on the same frequency. This technology is known as full duplex, and it could double the capacity of wireless networks at their most fundamental physical layer. Some militaries already use full duplex technology that relies on bulky equipment. To achieve full duplex in personal devices, researchers must design a circuit that can route incoming and outgoing signals, so they don’t collide while an antenna is transmitting and receiving data at the same time.

With these and other 5G technologies, engineers hope to build the wireless network that future smartphone users, VR gamers, and autonomous cars will rely on every day. Already, researchers and companies have set high expectations for 5G by promising ultralow latency and record-breaking data speeds for consumers. If they can solve the remaining challenges and figure out how to make all these systems work together, ultrafast 5G service could reach consumers in the next five years.

Task 2. Make up 5 questions to the text and ask your partner.

Task 3. Write a summary of the text above.

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